VOLUME XVI MAY, 1916 NUMBER 5

P.R.570

THE AMERICAN MUSEUM JOURNAL

JUL 31 1916
UNIV. OF MICH. LIBRARY

10 CENTS A COPY $1.50 A YEAR

The American Museum of Natural History

BOARD OF TRUSTEES

President
HENRY FAIRFIELD OSBORN

First Vice-President
CLEVELAND H. DODGE

Second Vice-President
J. P. MORGAN

Treasurer
HENRY P. DAVISON

Secretary
ADRIAN ISELIN, JR.

JOHN PURROY MITCHEL, MAYOR OF THE CITY OF NEW YORK
WILLIAM A. PRENDERGAST, COMPTROLLER OF THE CITY OF NEW YORK
CABOT WARD, PRESIDENT OF THE DEPARTMENT OF PARKS

GEORGE F. BAKER
FREDERICK F. BREWSTER
JOSEPH H. CHOATE
R. FULTON CUTTING
THOMAS DEWITT CUYLER
JAMES DOUGLAS
HENRY C. FRICK
MADISON GRANT
ANSON W. HARD
ARCHER M. HUNTINGTON
ARTHUR CURTISS JAMES
WALTER B. JAMES
A. D. JUILLIARD
CHARLES LANIER
SETH LOW
OGDEN MILLS
PERCY R. PYNE
JOHN B. TREVOR
FELIX M. WARBURG
GEORGE W. WICKERSHAM

ADMINISTRATIVE OFFICERS

Director
FREDERIC A. LUCAS

Assistant Treasurer
THE UNITED STATES TRUST COMPANY OF NEW YORK

Assistant Secretary
GEORGE H. SHERWOOD

SCIENTIFIC STAFF

FREDERIC A. LUCAS, Sc.D., Director

Geology and Invertebrate Palæontology

EDMUND OTIS HOVEY, Ph.D., Curator
CHESTER A. REEDS, Ph.D., Asst. Curator

Mineralogy

L. P. GRATACAP, A.M., Curator
GEORGE F. KUNZ, Ph.D., Honorary Curator Gems

Woods and Forestry

MARY CYNTHIA DICKERSON, B.S., Curator

Invertebrate Zoölogy

HENRY E. CRAMPTON, Ph.D., Curator
ROY W. MINER, A.B., Asst. Curator
FRANK E. LUTZ, Ph.D., Asst. Curator
L. P. GRATACAP, A.M., Curator Mollusca
A. J. MUTCHLER, Assistant
FRANK E. WATSON, B.S., Assistant
DANIEL M. FISK, A.M., Assistant
W. M. WHEELER, Ph.D., Hon. Curator Social Insects
A. L. TREADWELL, Ph.D., Hon. Curator Annulata
CHARLES W. LENG, B.S., Hon. Curator Coleoptera

Ichthyology and Herpetology

BASHFORD DEAN, Ph.D., Curator Emeritus
LOUIS HUSSAKOF, Ph.D., Curator Ichthyology
JOHN T. NICHOLS, A.B., Asst. Cur. Recent Fishes
MARY CYNTHIA DICKERSON, B.S., Assoc. Curator Herpetology

Mammalogy and Ornithology

J. A. ALLEN, Ph.D., Curator
FRANK M. CHAPMAN, Sc.D., Curator Ornithology
ROY C. ANDREWS, A.M., Asst. Cur. Mammalogy
W. DEW. MILLER, Asst. Curator Ornithology
H. E. ANTHONY, B.S., Assistant Mammalogy
HERBERT LANG, Assistant Mammalogy
JAMES P. CHAPIN, Assistant Ornithology

Vertebrate Palæontology

HENRY FAIRFIELD OSBORN, LL.D., D.Sc., Curator Emeritus
W. D. MATTHEW, Ph.D., Curator
WALTER GRANGER, Assoc. Curator [Mammals]
BARNUM BROWN, A.B., Assoc. Curator [Reptiles
WILLIAM K. GREGORY, Ph.D., Assoc. in Palæontology
CHARLES R. EASTMAN, Ph.D., Research Associate

Anthropology

CLARK WISSLER, Ph.D., Curator
PLINY E. GODDARD, Ph.D., Curator Ethnology
ROBERT H. LOWIE, Ph.D., Assoc. Curator
HERBERT J. SPINDEN, Ph.D., Asst. Curator
NELS C. NELSON, M.L., Asst. Curator
CHARLES W. MEAD, Asst. Curator
M. D. C. CRAWFORD, Research Associate in Textiles
GEO. BIRD GRINNELL, Ph.D., Research Associate in Ethnology
J. H. MCGREGOR, Ph.D., Research Associate in Anthropology

Anatomy and Physiology

RALPH W. TOWER, Ph.D., Curator

Public Health

CHARLES-EDWARD A. WINSLOW, M.S., Curator
ISRAEL J. KLIGLER, Ph.D., Assistant

Public Education

GEORGE H. SHERWOOD, A.M., Curator
G. CLYDE FISHER, Ph.D., Asst. Curator
ANN E. THOMAS, Ph.B., Assistant

Books and Publications

RALPH W. TOWER, Ph.D., Curator
IDA RICHARDSON HOOD, A.B., Asst. Librarian

THE AMERICAN MUSEUM JOURNAL

DEVOTED TO NATURAL HISTORY, EXPLORATION AND THE DEVELOPMENT OF PUBLIC EDUCATION THROUGH THE MUSEUM

May, 1916

VOLUME XVI, NUMBER 5

PUBLISHED MONTHLY FROM OCTOBER TO MAY INCLUSIVE, BY THE AMERICAN MUSEUM OF NATURAL HISTORY, NEW YORK CITY. TERMS: ONE DOLLAR AND A HALF PER YEAR, TWENTY CENTS PER COPY. ENTERED AS SECOND-CLASS MATTER JANUARY 12, 1907, AT THE POST-OFFICE AT BOSTON, MASSACHUSETTS, ACT OF CONGRESS, JULY 16, 1894.

CONTENTS FOR MAY

Cover, Children standing before the Flamingo Group in the American Museum

Frontispiece, The Most Beautiful of the Rock-hewn Monuments of Petra 272
From photograph made in the age-old city of Petra, by Lee Garnett Day

The Ruins of Ancient Petra....Lee Garnett Day and Joseph Wood, Jr. 273
Description and history of the forgotten capital of the Edomites, in the Arabian Desert, and the strange stupendous relics of its opulence twenty centuries ago
Illustrations from photographs by Lee Garnett Day

Reproductions in Color of Arabian Photographs..... 287
Showing rock tombs, temples, and amphitheatre in the long-deserted city of Petra, near Mount Hor in Arabia
From photographs by Lee Garnett Day

Three Polar Expeditions, 1913–1916.....Herbert L. Bridgman 291
History to date of the plans, doings, dangers, and fortunes of the Crocker Land; Stefánsson Arctic, and Shackleton Antarctic Expeditions

A Garden of Germs.....C.-E. A. Winslow 295
Account of the American Museum's collection of living bacteria and its service to science

Decorative Value of American Indian Art.....Esther A. Coster 301
Introduction by Mr. Walter Scott Perry, Director of the School of Fine and Applied Arts, Pratt Institute
Suggestions for adaptation of Indian art motives in various modern crafts

Moccasin Exhibit in the American Museum.....Clark Wissler 308
Showing principal moccasin patterns used by the Indians, and the relation between these and the decorative design
Illustrations from photographs of exhibits in the American Museum of Natural History

Sea Cows, Past and Present.....Frederic A. Lucas 315
History of the manatee, dugong, and rytina as recorded in science and fable

Men of the Old Stone Age.....G. Elliot Smith 319
Review of "Stone Age" controversies in Europe, and of Henry Fairfield Osborn's recent book on this subject

Vagrant Cats in the United States..... 326
Summary of bulletin recently issued by the Massachusetts State Board of Agriculture

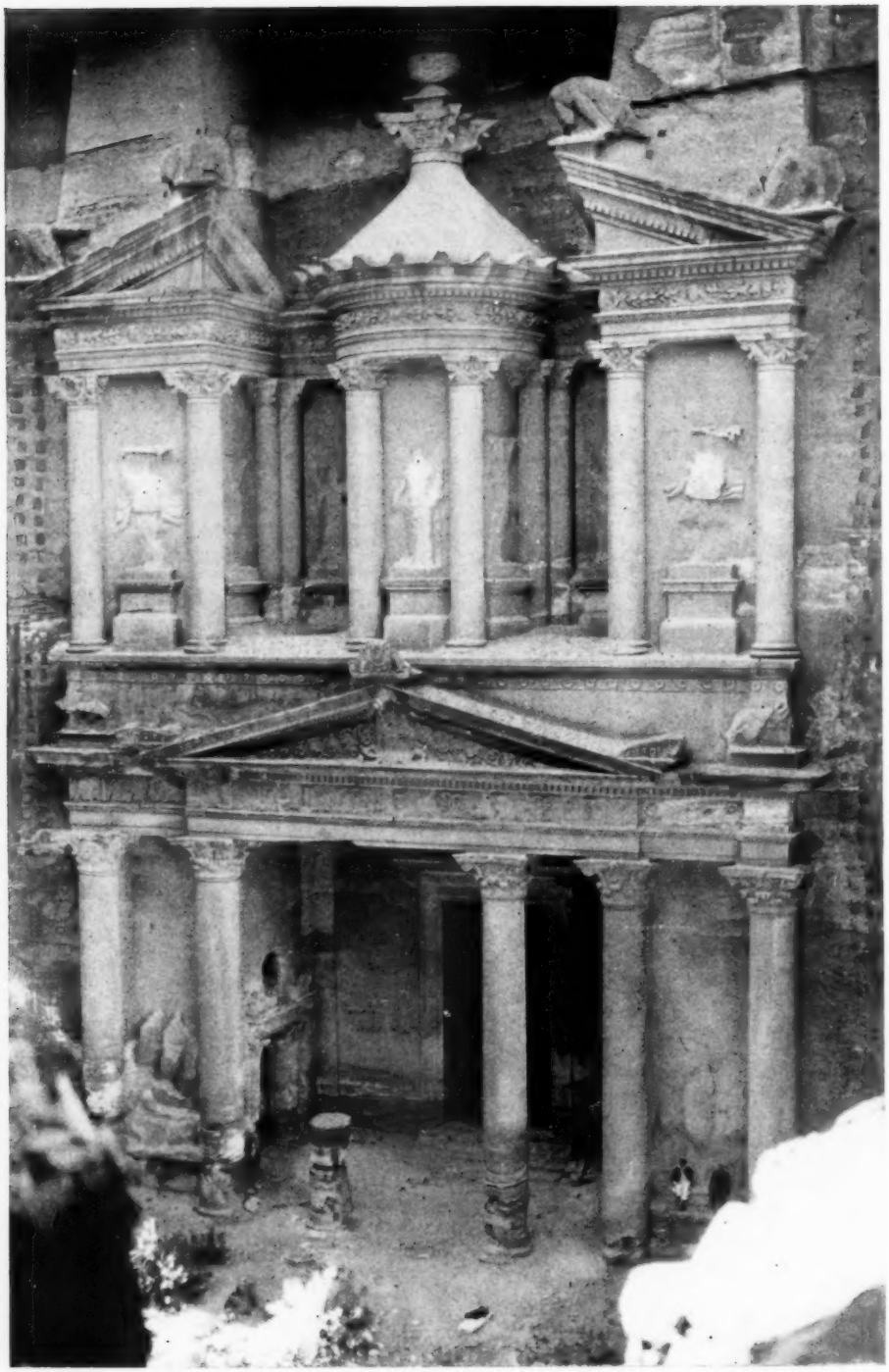
Bird Protective Laws and their Enforcement.....T. Gilbert Pearson 329
Account of the enactment and effect of federal laws for bird conservation in the United States

Museum Notes..... 333

Mary Cynthia Dickerson, *Editor*

Subscriptions should be addressed to the American Museum Journal, 77th St. and Central Park West, New York City.

The Journal is sent free to all members of the American Museum.



MOST BEAUTIFUL OF THE ROCK-HEWN MONUMENTS OF PETRA

El Khazneh, or "The Treasury" (named by Arabs), cut in a vast rose-colored cliff opposite the approach to Petra, has been so protected from wind and rain by overhanging rocks through the centuries, that it looks like a building recently finished. It was probably built about 106 A. D., when this section of Arabia was a part of the Roman Empire. Great must have been the opulence of Petra — always a safe retreat and impregnable storehouse for caravans of precious goods — when she could dedicate sumptuous monuments like El Khazneh to her rulers.

We were led to visit the ruins of mysterious Petra by the chance remarks of a French archæologist; we hastened to Beyrout and Damascus, then to El Maan, four hundred miles southward. Here we were in Arabia, and with Syrian interpreter and caravan of soldiers soon started into the desert and toward the purple mountains where Petra was hidden

THE AMERICAN MUSEUM JOURNAL

VOLUME XVI MAY, 1916 NUMBER 5

The Ruins of Ancient Petra

By LEE GARNETT DAY and JOSEPH WOOD, JR.

IT was in the fall of 1912 that a French archæologist, with whom we had unearthed some of the old Punic ruins at Dugga, in Tunisia, spoke to us of the ruins of Petra and their curious situation in the mountains of the Arabian desert. The idea of seeing a city so strange and so seldom visited appealed to us, and accordingly we soon accomplished the first stages of the journey to Beyrout and Damascus.

About four hundred miles below Damascus lies the village of El Maan. Here we alighted from a pilgrim train and, with the aid of a Syrian interpreter, Teep by name, made arrangements with the kaimakam to go on to Petra. Orders were given that very night, and after a few hours' sleep we arose at three in the morning to set out.

Our caravan of soldiers and Bedouin horse boys, extra pack animals and the ancient Teep, was soon under way, and we started into the desert. The cold was intense and there was a bitter wind blowing dust in our faces. Above, a full moon and brilliant stars shed a baleful light on the dreary wastes around us. The only sounds to be heard were the tread of feet and hoofs, and occasionally the howl of a scavenger dog of Maan.

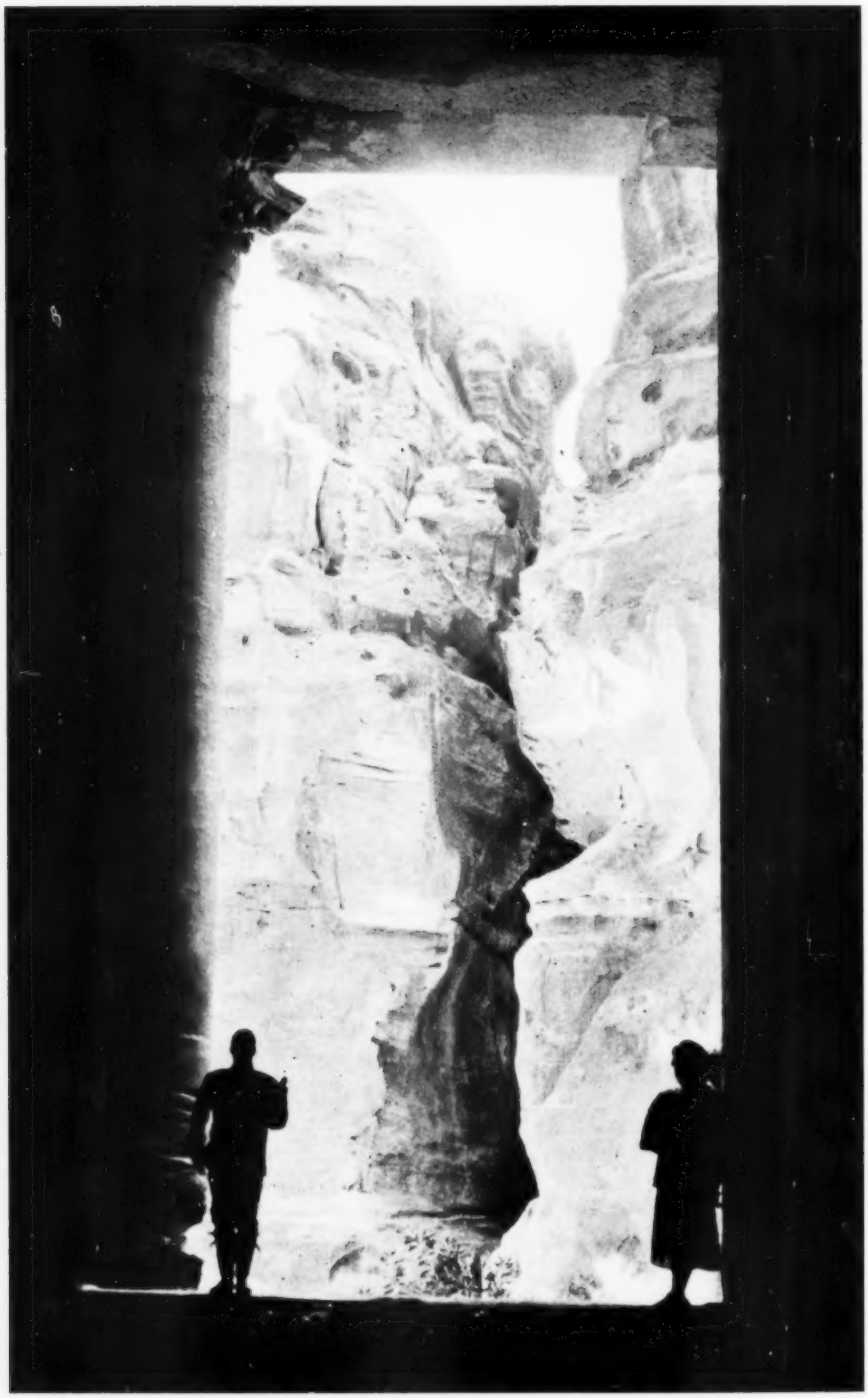
About one o'clock, we entered a limestone cañon two miles from the entrance of Petra itself. From this point we saw for the first time the mysterious red and purple complex in whose labyrinths lies the forgotten city. As we approached the purple mountains they presented an extraordinary appearance, for the soft sandstone has been carved by rain and wind-blown sand into grotesque shapes — gigantic mushrooms, spires and domes. Toward this riot of colorful forms we headed, winding in and out among the outlying ridges.

The early history of the ancient city of Petra is a matter of conjecture only, and it is not even known with certainty when that history began. From its impregnable situation, protected on all sides by practically unscalable mountains, through which but one narrow gorge makes a feasible means of entrance, it seems probable that Petra was inhabited from very early times.

The steep and lofty mountains among which it lies flank the eastern side of the Arabah, or El Ghor, a valley in Arabia leading from the southern extremity of the Red Sea to the northern end of the Gulf of Akabah. The biblical Mount Seir, of which Mount Hor is a peak, is the principal mountain of the range, and travelers approach Petra by a track which leads around Mount Hor and enters the plain of Petra from the south.

The Horites of the Bible may or may not have had a city on this site, but Petra was almost certainly the capital city of the Edomites, and Edom as a nation is recognized as older than Israel.

The first recorded inhabitants of



PERPENDICULAR WALLS OF PETRA'S ENTRANCE GORGE

The only entrance into the rock-encircled city is a narrow gorge one mile in length. Rocks tower perpendicularly on either side, obscuring the sunlight hundreds of feet overhead. Looking up from the abyss, high precipices appear through occasional openings, their ragged peaks, fantastically tinted in pink, yellow, and blue, glittering in sunshine. The passage is now half choked up, but shows signs of the care with which it was kept open in the prosperous times of Petra. The river was covered with a massive stone pavement and banked by stone walls. A channel was cut on each side at a higher level to provide for a constant supply of water to the city at all seasons, and a conduit of earthern pipes was bedded in mortar in a groove of the rocks. To provide for the swollen river in the rainy season, a long shaft twenty feet square was hewn through the wall of the gorge into the next valley

The photograph was taken from the doorway of the Khazneh showing the gorge at its inner end

Petra, or "Sela" — The Rock — were the Nabataeans, a people of ancient Arabia who seem to have occupied the country evacuated by the Edomites when the latter pressed forward into southern Judæa, and to have succeeded to its commercial prosperity as a center for the trade routes from Egypt. The importance of the city under Nabataean rule increased until, during the reign of king Aretas III, surnamed "Friend of the Greeks," royal coins appeared. The city must then have had a large population and have presented a general Grecian appearance.

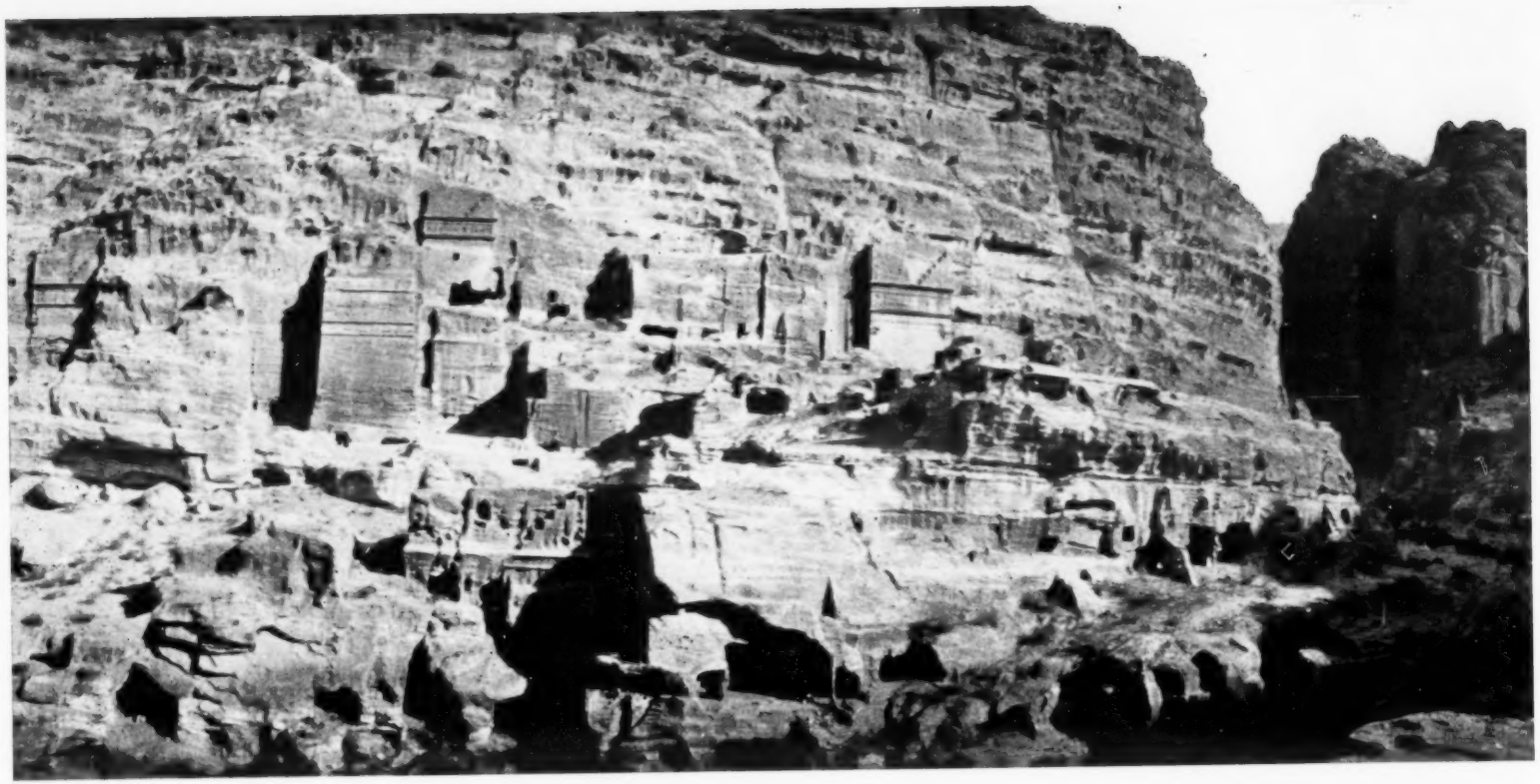
In A. D. 106, Arabia Petræa became part of the Roman Empire, and the Nabataean, or native dynasty, came to an end, but the city continued to flourish. In A. D. 131, Hadrian, that indefatigable traveler, visited the city, and it is probable that the superb Khazneh and the Deir were built at this time. A century later, when the city was at the height of its splendor and power, some sudden catastrophe put an end to the issue of coinage and the building of sumptuous tombs. The activity of Palmyra and of the Persians diverted the trade routes, thus removing the great *raison d'etre* of Petra's power. When no longer a great storehouse of precious goods and a safe retreat for passing caravans, Petra rapidly dwindled in population and importance, although it still remained a religious center.

Christianity found its way there at an early date, Athanasius mentioning a Bishop of Petra; but, as in all of northern Arabia, Christianity was swept away by the Mohammedan conquest in A. D. 629–632. The Crusaders were the last to hold the city, Baldwin the First forming of it a baronial fief, known as the Chateau de la Valée de Sela. In 1189 the Crusaders left, but remnants of their citadel still remain.

The extraordinary ruins of Petra were an object of curiosity to eastern rulers during the middle ages, but after the Crusaders' departure, nearly seven hundred years elapsed before another European, Burckhardt, visited them in 1812. Owing to the wildness of the natives, who had no one to keep them in subjection, few Europeans visited the place during the nineteenth century, and then only with large escorts of soldiers, in some cases even artillery. The Turkish Government, however, has changed conditions within the ten years, so that now, except from chance brigands, there is nothing to fear. As far as I know, very little has been published in English on the marvels of Petra, and this combined with its inaccessibility, probably accounts for the fact that very few persons have seen what must certainly be reckoned as one of the wonders of the world.

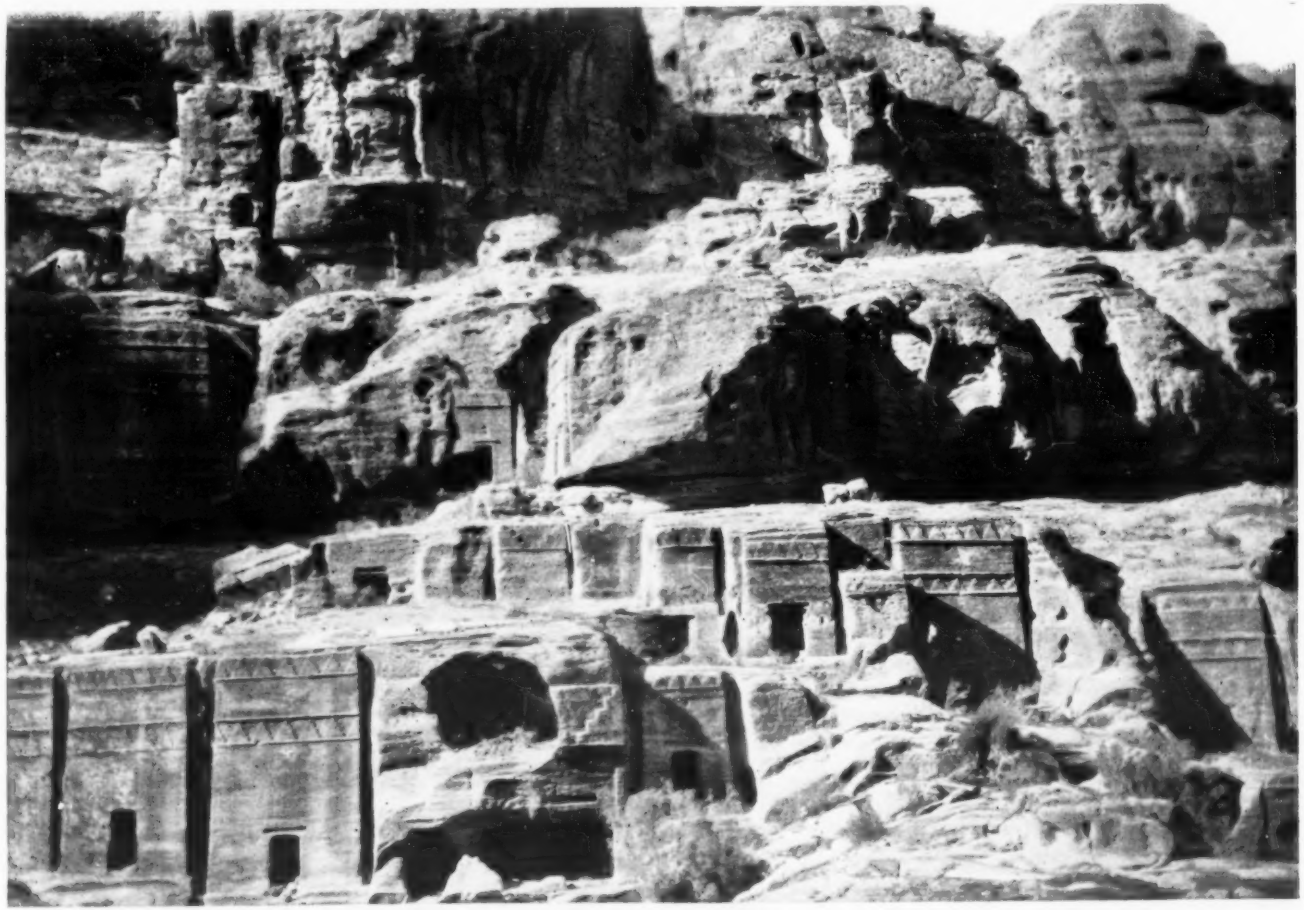
We slowly made our way over the rocky bed of the Musa, our horses having difficulty in finding a sure footing, and presently came near to the towering painted cliffs, where we saw the first evidences of ancient civilization. Cut into the rock, here of a cream color, was a tomb, perhaps twenty feet square, its entire face protected by a portico of circular arches, with columns cut from the rock and left *in situ*. Doors opened into the mountain from this tomb, and in the pitch-black vaults lived families of the wretched natives, who now inhabit some of the outlying tombs. A little farther on were two immense pillars of yellow rock, formed by hewing two of the mushroom-shaped formations, which are a peculiarity of this district.

The surroundings were so uncanny, due to the work both of nature and man, that our whole party became silent. Turning a corner, we came to the face of the cliffs and saw the entrance to the famous eastern *sik* or gorge. Imagine



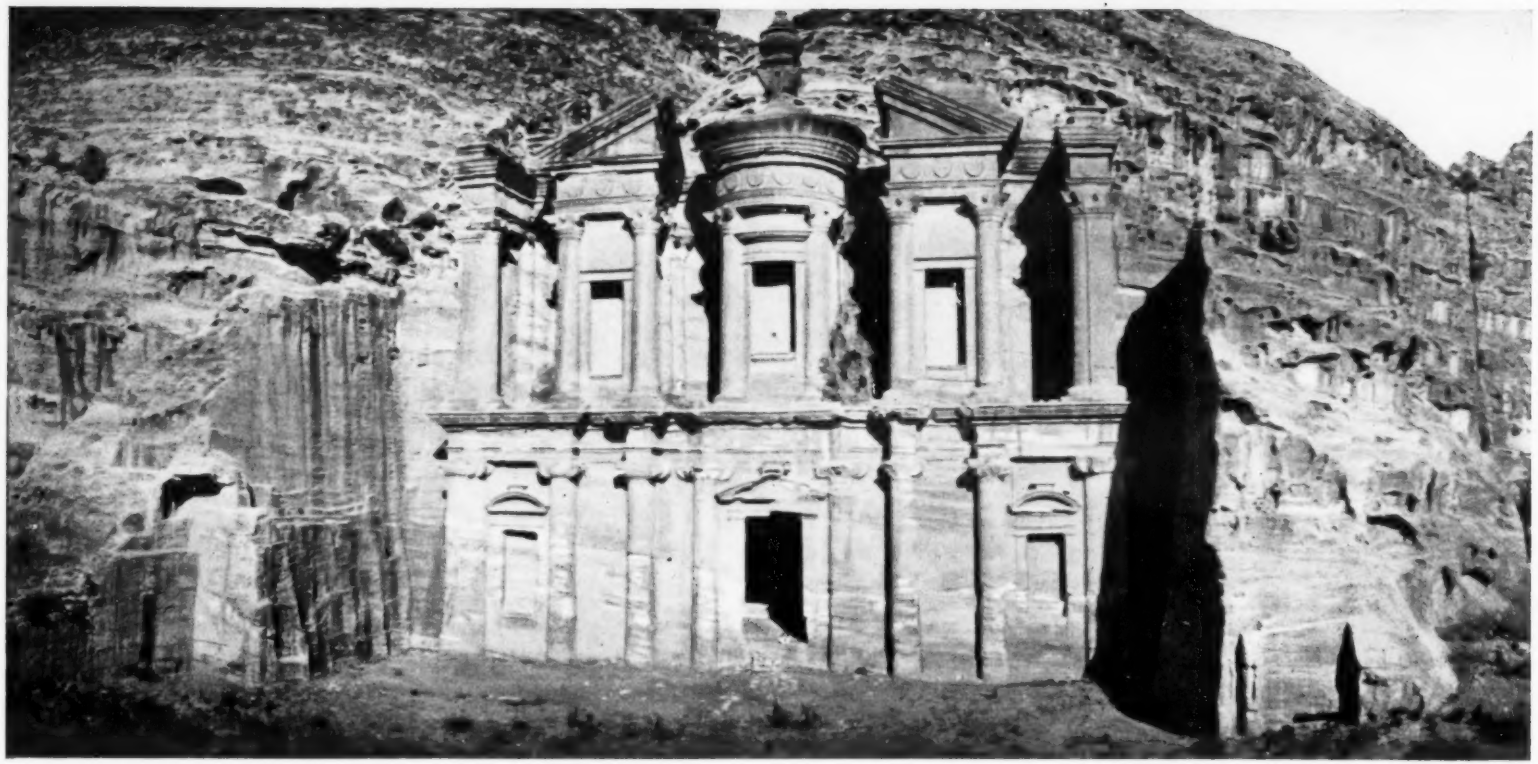
NORTHERN BOUNDARY OF PETRA

The weathering of this part of the mountain through the centuries has destroyed hundreds of ancient tombs; and the protection of these sacred places from the wild freshets was evidently a problem from the beginning. The Nabatæans were the first recorded inhabitants of Petra (600 B. C.), although the biblical Edomites probably occupied the city previously, before going into Judæa. The Nabatæans built protecting walls around many of the tombs in the valley, and hewed deep channels above many of the long rows of sepulchres to take the water of the rising cascades and thus protect the lower-lying tombs. Where protecting walls did not exist or fell into ruins, the tombs have been literally washed away by the water that surged down the cliffs



TOMBS CARVED IN BRILLIANTLY COLORED SANDSTONE, 600 B. C.

The Nabatæans, dating probably from the sixth century, B. C., hewed sepulchres from the base to the topmost crag of the rocky ramparts which hemmed in their city. These older tombs show the native architecture preceding the influence of the Greeks, who became friendly with the Nabatæans. The façade of each tomb is thirty feet high, and the door leads into an unornamented chamber. Staircases cut in the rock give access to these habitations of death, which from all sides once looked down upon the crowded life in the city below



TEMPLE CARVED IN THE ROCK AT THE CREST OF A CLIFF IN PETRA

Executed after Rome came into power in Arabia, probably in the time of Hadrian (131 A. D.). Cut in the face of the topmost crags of the mountain, and visible to the traveler across the desert long before he enters Petra, the gigantic monolithic temple, "El Deir," or the "Convent," is on a narrow plateau reached by climbing a steep ravine by means of a broad stone staircase cut in the rock. There is no doubt that in the bright days of the ancient capital this was a much frequented spot, connected with religious ceremonies. The doorway of the Deir, thirty feet high and seventeen wide, leads into a chamber forty feet square with an altar at one end. The great stairway, itself a monumental work, now much injured by the action of torrents, winds among the countless tombs, and passes along the edge of yawning chasms. Probably it has seen the whole population of Petra, pouring up and down the long ascent to this strange crest of the romantic city

a wavy line of black drawn down a red and purple slate, and you will have an idea of this entrance to Petra. The river Musa has cut a bed for itself through the three or four hundred feet of sandstone ridge, and into this gorge we entered. Once within, all sunlight vanished and, by the pale light which did reach the bottom of the cleft, we saw the overhanging walls painted in natural colors of every shade and intensity. Here a ribbon of yellow; above it a background of red, veined with narrow bands of green, blue, and white. In some places dozens of parallel striæ, each of a different color, bent in graceful curves until they blended into some new decorative scheme. High above stood rock fingers forty or fifty feet in height and but a few feet in diameter, their tops bathed in the sun, and each of a color that beggars description — some banded, some solid red, golden or purple. If there were not a single cutting or ruin of any kind here, the natural wonders of the gorge and the basin beyond would more than repay any trouble taken to see them.

A hundred feet from the entrance, and the flume had narrowed from twenty feet to half that width and had curved, so that now we could see but a short distance forward, backward and above; for like a glacial crevasse, the ghastly smooth walls, with foothold for no living thing, bent over us, shutting out the sky. The effect was indescribably weird. One had entered not an ordinary cañon, but into the vitals of the mountains themselves. Everything was unnatural; the colors, the goblin scenery, the engulfing walls — and we knew that farther on the hills held greater and more mysterious surprises in store.

On our right as we continued inward, appeared the black entrance to a tunnel. A shaft twenty feet square and three hundred and sixty feet long had sometime been hewn through the wall of the gorge into another and parallel valley. Five hundred feet beyond, the gorge abruptly ended, and we emerged into the basin of Petra, relieved to escape from the overpowering oppression of close perpendicular walls.

Before us, hemmed in by rose-colored walls from two to four hundred feet in height, lay an L-shaped valley, narrow near the entrance to the *sik*, but widening after a quarter of a mile, into a plain, perhaps a square mile in extent. On either side of us were continuous rock tombs in three or four rows, one above the other, extending on the right to the farther end of the basin, and on the left, cut along the length of the so-called "Mount of Sacrifice." This high rocky butte rose several hundred feet above the valley, ascended by a stupendous staircase cut in its sides. In its base was hewn a gigantic amphitheatre, its tiers of carmine-colored seats capable of accommodating over three thousand people.

The walls of this narrow portion of the basin contain the oldest tombs built by the Nabatæans, the construction of which dates back to about 800 B. C. The pylon-like façades, twenty to thirty feet high, are pierced in the center by a single door, above which are steplike decorations, similar to those sometimes employed by the Navajo. The façades of some of these step tombs extend several feet out from the cliff from which they are carved: others are flush with it. Everything is of salmon-colored rock,

"A rose-red city, half as old as time."

The silence was absolute. Not a living creature but ourselves disturbed the quiet of the valley, which once must have echoed with the plaudits of the thousands seated in the amphitheatre.

We made our way past the rows of stately tombs, until the valley broadened and swung to the west. Here was the site of a city with an hundred thousand inhabitants, a fact borne out by the countless hewn masonry blocks, which covered an area of a square mile to a depth of many feet. One building remains nearly intact, a temple of considerable size, its great walls containing secret passageways, in which, it is told, the priests concealed themselves and astounded the worshipers by voices purporting to come from the gods.

We explored many tombs and, late in the afternoon, found a very convenient suite, which we appropriated. It was cut about seventy feet above the stream's bed, and was approached by a stone staircase. In front of the door of this tomb was a level terrace, a few yards square, on which we did our cooking, and which commanded a view of a large part of the basin. Somewhat below our room, and connected with it on the inside by a stairway, was a second tomb, which we apportioned to Teep. Below that was a large grotto, in which the horses, Bedouin boys and soldier dwelt in a happy community. The singular number is used with reference to our army, as shortly after our arrival, we had decided that it was needless and extravagant to have more than one soldier, and had sent the others back to El Maan.

The floor of our apartment was inches deep in dust, the removal of which occupied the greater part of the remaining hours of daylight. Then the Bedouins collected a quantity of grass and willows, of which we made beds.

The nights were very cold and clear, disturbed only by the howling of jackals. Soon after sunset the valley became dark as the pit, but about nine o'clock, directly across from our home, the moon appeared over the mountain ramparts, giving a weird effect of being in the basin itself, with the cliffs behind it. We rambled about that dead city at night, half afraid of what might emerge from its gaping doors. In these wanderings we went alone, the natives being unwilling to leave the cheering influence of the fire.

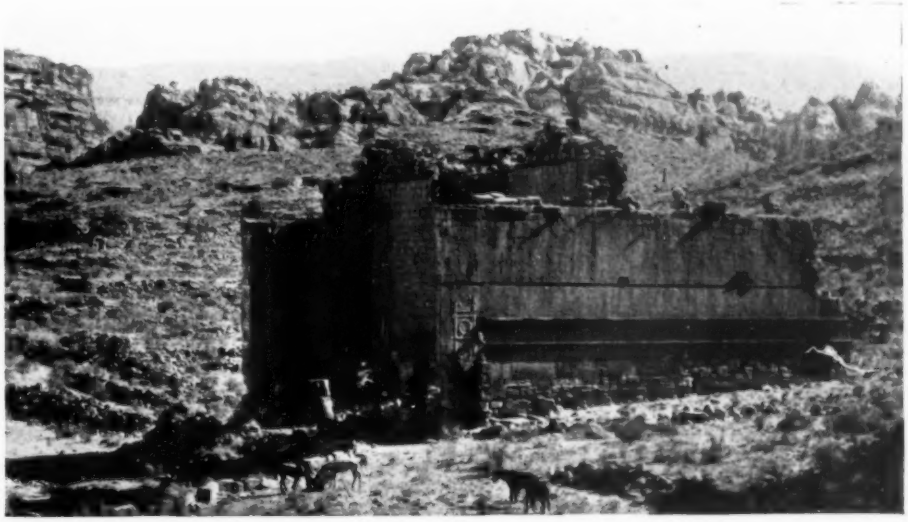
Near our end of the valley was a side gorge with vertical purple walls, at the base of which began a staircase, cut from the rock. For half a mile this staircase, four yards wide, winds upward into the labyrinths of this goblin country. In some places it is cut in a shelf along the edge of a yellow abyss; in others through an intervening buttress thirty or forty feet high, composed of sinuous veins of red, purple, blue, and gold. Finally, after working along the edge of a ghastly chasm with overhanging walls, the way arrives at a plateau, backed by a honeycombed wall of gray which faces out into the blue spaces of the western desert.

In this cliff is a gigantic cutting, comparable in size to the Abu Simbel in Egypt, or the Kailas Temple in India. This façade, standing for centuries in this remote and terrible spot, is very impressive. The architecture of the Deir, as it is called, is similar to that of the Khazneh, but not of so pure a style, nor are its carvings so delicate. At the same time, the location and magnitude of the Deir render it more astonishing. The façade is in the neighborhood of one hundred and sixty feet in height, surmounted by an urn, hewn *in situ*, like the rest of the cutting.

We climbed this by means of a series of staggered holes cut in the cliff, like a vertical ladder, from the ground to the summit of the façade. The urn proved to be of gigantic size; so huge, in fact, that a horse and carriage could be driven around its base.

Like all the hewn tombs, temples, and

The ruins of mysterious Petra.— The site of Petra is covered with heaps of hewn stones, foundations of buildings, fragments of columns, and vestiges of paved streets, indicating a crowded city of many thousand inhabitants. The only level space was along the course of the river. The bottom of the river was paved, in some places it was completely covered in, bridges were thrown across it, and a strong embankment of hewn stone confined the turbulence of the current. A paved way, of which portions still exist, ran parallel with the stream, and was bordered with public buildings, now demolished and swept away by the winter torrents. The "three-storied" tomb, shown in the distance above, faces the chief concourse of the city



The valley of Petra is traversed by many streams, which become torrents in the rainy season, and to the breaking of bounds of these waters is to be ascribed the fact that among the ruins of the ancient city scarcely one stone now stands upon another. Only one building, called by the Arabs the "Kaszr Faraoun," or Palace of Pharoah, has outlasted the centuries. This edifice, in a corrupt style of late Roman architecture, decorated with stucco, may have been a palace, temple, or public building. Near it still stand the remains of an archway apparently leading to a raised public forum. The front of the Kaszr Faraoun had a four-columned portico now in ruins; the interior is divided into two parallel chambers, and there were several stories. Beams of wood, let in between the courses of masonry, continue to this day, a strong proof of the dryness of the climate

APPROACH TO PETRA'S "MOUNT OF SACRIFICE"

Here, evidently, the people of ancient Petra stood on feast days, attendant to the services performed by the priests at the altar on the summit of the mountain just above. A vast platform has been leveled here by cutting down the rock, leaving the two thirty-foot obelisks in the foreground to indicate the original height. They stand about one hundred feet apart. A staircase cut in the rock, very much like that leading to the Deir, ascends from the plain of the city

THE ALTARS FOR SACRIFICE ABOVE THE CITY

On this highest of the mountains surrounding Petra, is the most complete specimen of ancient Semitic "high place" yet discovered. There are two altars; the principal one is rectangular. A hollow on the top is possibly intended for fire, and a reservoir for water is near by. A large rectangular basin is cut out in front of the altar. The other altar is round, provided with a blood pool at one side, and was probably used for the slaughter of the victim before the sacrifice. Both altars face the east. This ancient sanctuary is older than the oldest monument in Petra, and its magnificently wild and impressive situation may have been chosen as a place of worship even before Petra was inhabited. To the left, beyond the range of hills, appears the biblical Mount Hor, the site of the tomb of Aaron

public buildings in Petra, the interior of the Deir consists of a rectangular chamber, bare of any ornamentation or columns, its sole opening consisting of a battered doorway about twenty feet high. A hundred feet from the door, in front of the temple, is a large altar, cut from a natural knob of rock some twenty feet high. Leading up to this is a staircase of small dimensions, evidently intended for the use of the priests only. Beyond the altar lies a chasm several hundred feet in depth, perhaps fifty feet wide, with perpendicular sides, while on the opposite side is a wall of yellow, rising to a height of a hundred feet, its topmost ridge ornamented with cream-colored domes resembling giant beehives.

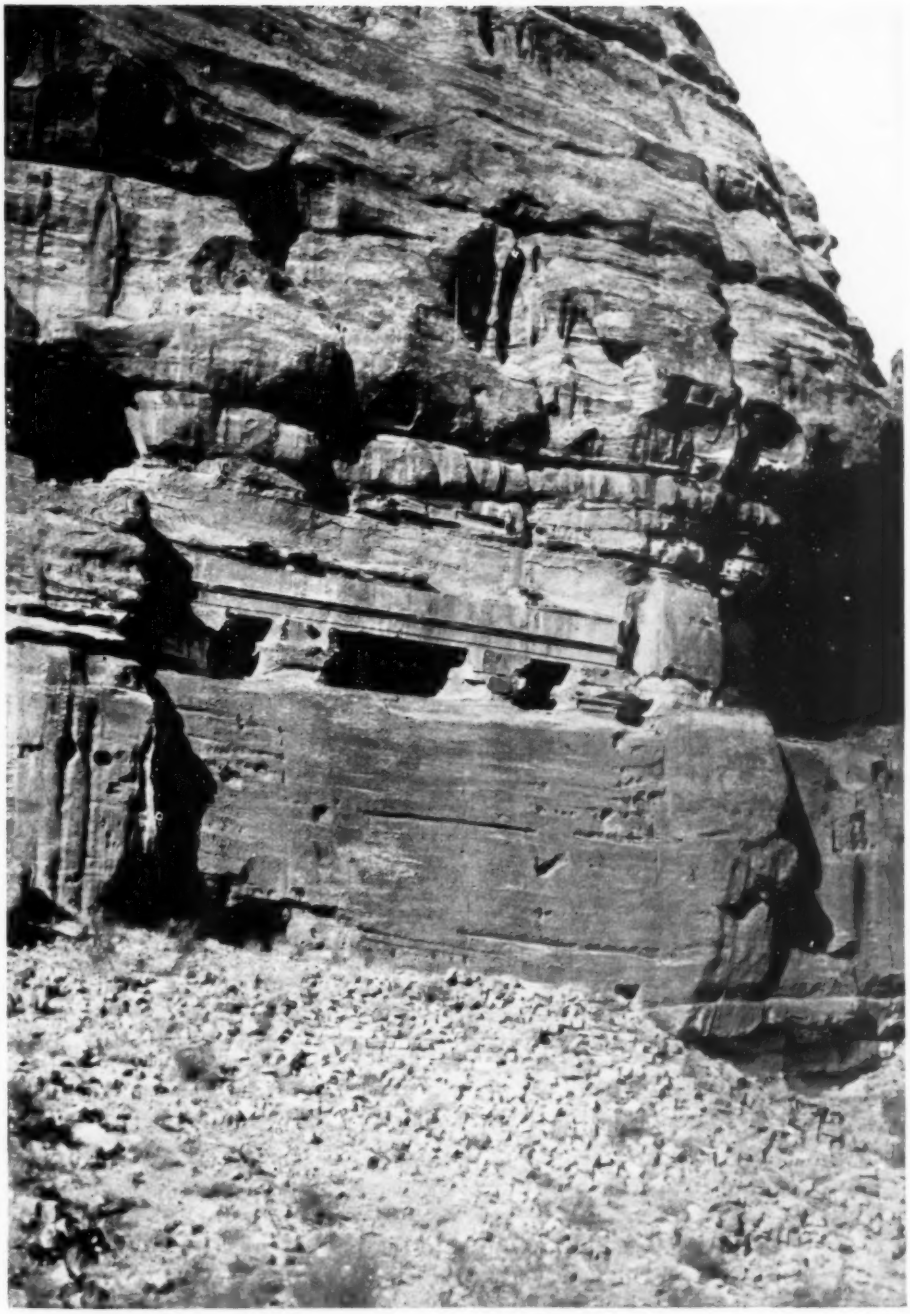
Near our headquarters was a small tomb consisting of a rectangular chamber, hollowed in rock of a pinkish hue, veined with white lines. The walls of this room were covered with hundreds of recesses some six inches square, divided from one another by walls an inch or so in thickness. The cellular construction has given to this tomb the name "columbarium," or pigeonhole tomb.

Only a few yards away from the columbarium was an unfinished tomb, which illustrated the method used in constructing the many façades. First a vertical cliff of the requisite height was chosen, and a ladder of staggered holes cut in its face. By means of this recessed ladder, bronze or iron bars were driven into the cliff in a horizontal line, a few feet below the level fixed for the highest part of the façade. Supported by these bars, workmen then cut into the rock, forming a deep horizontal gallery, extending the width of the intended construction. This recess once cut, numerous workmen could enter it and, continually cutting down its floor, scarp the face of the cliff to a plane surface. They would then deepen the upper gallery and, in a like manner, always cutting downward, complete the actual carving, arriving eventually at the base. In this way the use of scaffolding was eliminated. Of this unfinished tomb, the scarping of the rock face, the initial gallery, and the rough capitals of four columns are alone completed.

On the north wall of the basin is a series of the largest and finest façades in Petra, excelled in workmanship, size and beauty only by the Khazneh and the Deir. The "tomb with the urn," built on the same lines as the Khazneh, the "tomb with the portico," and the "three-storied tomb" are all works of great magnitude. The last mentioned has an interior room over one hundred and twenty feet square, which, like the rest of these chambers, is inhabited during the rainy season by tribes of nomads, together with their cattle, sheep and goats. We were in Petra but a few days in advance of the time when the dead city is infested with these desert peoples.

The façades of this north wall show many kinds of architecture: the Nabatæan, which is the oldest and reminiscent of the Egyptian style; pure Greek, the result of Greek influence in the reign of King Aretas, 100 B. C.; the best of Roman designs, such as the Khazneh, and also, later still in point of time, a hybrid architecture, partly Greek and partly Roman, of which the Deir is a fine example.

The "Mount of Sacrifice," which dominates the basin, stands at its eastern extremity, near the defile which furnishes the sole entrance to Petra. Its color is carmine at the base, changing to purple and yellow toward the summit. The northern base was originally honeycombed with tombs, but many of these were totally removed and others rendered mere frontless caves by the excavation necessary to build the theatre.



UNFINISHED TOMB IN PETRA

In hewing out the ornamental façade of a tomb the workmen began from above. The face of the rock was first scarped to the perpendicular and on its smooth surface the design of the tomb was traced. Then, working in a horizontal gallery cut in the rock, the capitals of the columns were cut out, and this work, with about a foot of the column itself and the bare lines of the entablature above, is all that has been finished. Working downward is obviously the easiest way and is that followed in the case of the celebrated cave temples at Elephanta, Salsette, Ellora, Ajuntah, and other places in the west of India. A doorway in the lower left-hand corner of the unfinished tomb admits to a good-sized chamber, containing receptacles for dead bodies

This isolated peak was the religious center of the city, and had apparently been a place of worship even before the first Nabatæan tombs were built. All over it are tombs of the oldest design, small tablets, and here and there a rock altar.

From base to summit is a vast staircase, equal in size to that leading to the Deir. This leads up, either by gentle steps or inclined planes, to an artificial plateau forty feet below the main summit, and separated from it by a shallow notch. Primarily this eminence must have nearly equaled the elevation of the highest point, but it has been entirely hewn down by industrious ancients to its present level, apparently for the sole purpose of leaving two obelisks about thirty feet high, which indicate the original level of the rock. These red pillars, one hundred feet apart and still attached at the base to the mother rock, represent a stupendous amount of labor, quite equal to that required to build the staircase, or carve out the Deir.

Near the southern edge of the plateau is a yellow stone altar cut, of course, from the living rock. Across the notch, on the west side of the main summit, are the remains of yet another civilization; a citadel of the Crusaders. These worthies built two of these fortresses during the twelfth century, to guard the city; both of which are now mere piles of masonry blocks, with scarcely one stone standing on another.[1]

Beyond the Crusaders' citadel, on the highest point of the mountain, is a large triple altar and a shallow rectangular basin of considerable size — relics of Semitic worship. These were probably hewn long before the earliest time when Petra was inhabited, and indeed represent the most complete specimen known of an ancient Semitic sanctuary. No more suitable place for worship could have been chosen than this eminence, rising above a wild valley, guarded by winding and dreadful abysses, which thread their way among painted mountains.

After our period of study, exploration, and mild adventure, we were loath to leave the valley where each day had brought new evidence of forgotten splendor, but trains on the Hedjaz Railroad were infrequent, so with a last visit to the Deir, we prepared to leave. We dispatched our baggage and horses in the early morning, and late in the afternoon, left the *sik* and rode to the small Bedouin village of Wadi Musa. Here we were welcomed by the sheik and invited to share his evening meal.

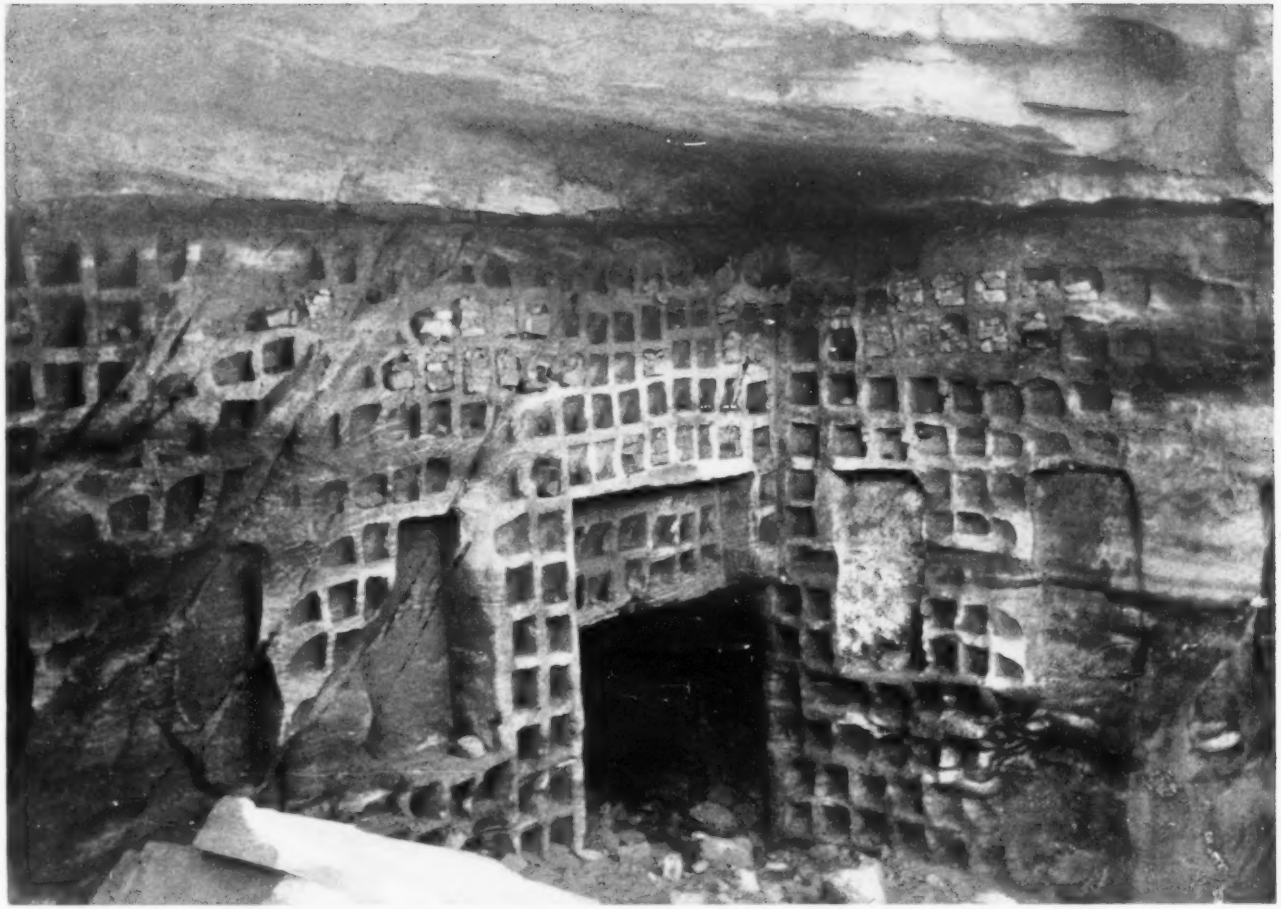
Seated with great ceremony on a large rug laid on the earthen floor of the low-ceiled house, we silently ate kouskous and roasted goat's flesh and drank deliciously spiced coffee. Around us gathered the tribal leaders, courteous though mute, and very distinguished looking in the dim light of an oil torch, with their patriarchal beards and white robes. At nine the moon rose, the signal for our departure. We thanked the hospitable sheik, donned our heaviest clothes and started on our all-night ride to El Maan.

At Damascus two days later, the last sunset at Petra was a vivid recollection, as it is even now. When the valley is in black shadow the summit of the "Mount of Sacrifice" still glows with the red horizontal rays that pour through the gap in the surrounding mountains.

[1] Of the thousands of buildings once composing the city, as noticed before, only one, and that by virtue of the size of its stones, still stands. Even the heavy causeways and bridges are entirely dissociated, and in the entire valley there are not, as I remember, a score of places where even a few courses of masonry are still intact. The individual building blocks were carefully squared, and are even now suitable for use. The natives of Wadi Musa have taken advantage of this circumstance, and that entire village is built of the creamy stones of ancient Petra.

GIANT URN CARVED FROM THE SOLID ROCK IN PETRA, THE STRANGE LOST CITY OF THE ARABIAN DESERT

The size of this urn, one hundred and sixty feet above the ground, crowning El Deir, is such that a horse and carriage could be driven around on its base. El Deir is gray in tone, contrasting with the fantastic color of most of Petra's mountains. (The general tint of the sandstone is a fine rich red, but the surface of the rock is veined with white, saffron, orange, vermilion, pink, crimson, and violet in endless variations, producing beautiful or bizarre effects.) El Deir, the most immense of Petra's rock-hewn monoliths, compares in size with the Abu Simbel in Egypt, or the Kailas Temple in India. We climbed to the urn by means of a vertical ladder of holes cut in the cliff



REMAINS TODAY OF A "PIGEONCOTE" TOMB IN THE DEAD CITY

We wandered through the labyrinths of the silent ruins, deciphering the work done on the soft sandstone by wind and rain through the ages and the work done by human hands of the past, tracing the influence of the native Nabatæan, the Greek, the Roman, the influence of Christian and Mohammedan. We wandered through the dead city also at night, half afraid of what might emerge from the gaping doors. The small niches in the walls of this tomb, very like those found in the Roman catacombs, were used to hold the ashes of the dead. Many niches are still sealed, especially those high out of reach. Similar tombs, often very beautiful with finely chased portals, are hidden away among the rocky heights and ravines around the city

very beautiful with finely chased portals, are hidden away among the rocky heights and ravines around the city

RUIN AND SILENCE WHERE PLAUDITS ONCE CHEERED THE CITY

The amphitheatre was hewn at the base of a huge rocky butt of one of Petra's mountains, and its thirty-five tiers of red and purple seats could easily accommodate five thousand spectators. The elevated stage has now fallen into the stream and been covered with sand and silt, but the bases of the columns of the proscenium still remain in their original places, hidden amongst grass and flowers. Few today have seen Petra, although it is one of the marvels of the earth. After the Crusaders left in 1189, the city remained deserted except by bands of wild natives. Until within the ten years it has been necessary to approach the ruins with large bodies of armed soldiers. Now, however, any natives occupying the pitch-black vaults that open into the mountain from the doors of the tombs, are a wretched lot and not to be feared

VIEW OF THE NORTH WALL OF PETRA

The most striking façade in the north wall of Petra is the Corinthian or "three-storied" tomb (the ornaments running across it are not unlike Corinthian capitals). In a commanding situation, overlooking the stream and the city, probably heading the slope of the principal street, this stupendous tomb of some forgotten king represents vast wealth and vast labor. Its four entrances, adorned by pilasters, lead into four connecting chambers, rough-hewn and bare—now occupied in the rainy season by tribes of native herdsmen. Adjoining it at the right is another splendid tomb, whose upper story consists of three miniature temples separated by deep niches for statuary. Water from the rocks above them, and their bleak situation exposed to the winds, have caused much injury to the architectural ornament of these tombs. The Bedouin in the foreground, with antediluvian musket, and horse trappings in the style of the Crusaders, was an attendant of our party

Three Polar Expeditions, 1913-1916

AMERICAN, CROCKER LAND EXPEDITION; CANADIAN, STEFÁNSSON ARCTIC EXPEDITION; BRITISH, SHACKLETON ANTARCTIC EXPEDITION

By HERBERT L. BRIDGMAN

Secretary of the Peary Arctic Club

Since the JOURNAL for May has been so greatly delayed, it is possible to include late news of the Crocker Land Expedition. Mr. Maurice C. Tanquary reached New York June 20, by way of Copenhagen, after a 1300-mile sledge journey across Melville Bay and through Danish Greenland. When the relief ship "Cluett" sent last summer to bring back the expedition to New York failed in its purpose, three members of the expedition, Messrs. Maurice C. Tanquary, Fitzhugh Green and Jerome Lee Allen, planned to come out by way of Copenhagen. They left the main party January 20, and began the long journey down the coast of Greenland under the guidance of Mr. Peter Freuchen of Thule, North Star Bay. They reached Upernivik February 11, and Umanak March 3, Danish settlements where they were received with great cordiality. At the latter place they were fortunate in gaining the friendly services of Mr. Knud Balle, high priest of Greenland, who gave his help as guide and interpreter for the further journey. They reached Egedesminde March 21 where they had planned to join the regular annual mail sledge for Holstensborg. Conditions of travel were so poor, however, it was judged that one of the party might get through safely, but not all three. Mr. Tanquary was chosen, Messrs. Green and Allen remaining at Egedesminde to join the next mail party.

It now comes out that Mr. Green has been requested by cable from the Crocker Land Committee in New York to act as commander of the new relief ship "Danmark," which has been engaged in south Greenland to bring out the members of the expedition this summer. Therefore he will go back to North Star Bay, where Dr. Hovey or Mr. MacMillan will take command. Thus Mr. Allen is left alone to follow the mail sledge to Holstensborg and take steamer from Copenhagen for New York.

Throughout the months of difficulty in the Arctic both the Crocker Land Expedition and the relief party have enjoyed the coöperation and support of the Danish people, and especially of the two Danish gentlemen, Mr. Knud Rasmussen and Mr. Peter Freuchen. For the very cordial spirit of this coöperation, and for the very considerable material benefit, the Crocker Land Committee would express profound appreciation.— THE EDITOR.

THE saying, "*Inter arma leges silent*," of the olden time in Rome, reduces itself in terms of the present to "In the greatest war the world has known, polar expeditions receive scant attention." Three parties, adventurers of science and discovery, isolated — two for three years, the other for two — strive in doubt and mystery, and were it not for the shadow which falls from the East the world would be alert to learn the fate of the absent, and if necessary, to succor them. It is perhaps worth while briefly to review and set forth in connected narrative, the facts, meager and fragmentary, which have at intervals become known concerning these expeditions, in order that when their fate shall finally be determined and the results weighed and measured, we may have a fairly accurate idea of the whole story of each from beginning to end.

In the early summer of 1913 the Crocker Land Expedition under Mr. Donald B. MacMillan, supported by the American Museum of Natural History, the American Geographical Society, and the University of Illinois, was gathering its forces on the Atlantic coast — at the same time that Stefánsson was making ready at Vancouver for the Canadian advance into the North, and thinly veiled rivalry existed between the two expeditions as to which should reach Crocker Land, now known to be non-existent. Leaving the Brooklyn Navy Yard July 2, in the chartered "Diana," MacMillan, leader, Ensign Fitzhugh Green, United States Navy, topographer, Messrs. W. Elmer Ekblaw, geologist, Maurice C. Tanquary, naturalist, and Harrison J. Hunt, surgeon, constituted an efficient, well-balanced and well-equipped party. The expedition struck its first bad luck on the rocks of Red Bay, Labrador, compelling delay, transhipment to the "Erik," and arrival at Etah too late to cross Smith Sound. Hard work all win-

ter however, for which Mr. MacMillan's former Peary discipline and acquaintance with the Eskimos peculiarly fitted him, permitted a base in Buchanan Bay on the west side of Smith Sound. From there an overland march to Cape Thomas Hubbard — opening the Peary cairns of 1906 at that point — launched the expedition in good form in March 1914, on a straight course for the supposed Crocker Land. Months later, and after much peril, Mr. MacMillan and Ensign Green returned to report that although they had placed themselves upon the exact location, only sea, with no sign of land in any direction, was visible; and that the further work of the expedition must necessarily omit its central objective.

Mr. MacMillan had however brought his entire party through the winter in good health, the summer had been profitably occupied in scientific research and the arrival of relief in the next season, 1915, was confidently awaited. The three organizations supporting the expedition, therefore, a year ago in July, 1915, dispatched Curator E. O. Hovey, of the American Museum, in the Grenfell Labrador schooner "Cluett" to bring home the expedition.

The "Cluett" however did not return. Midwinter brought news of her disablement in Wostenholm Sound and the certainty that both parties, the Crocker Land and its relief, must winter as best they might. Late in May of this year, 1916, Mr. Tanquary forwarded from the Faroe Islands a cablegram from Dr. Hovey telling of disappointment, difficulty and failure. The members of the party were alive and well, scattered at various stations and in different lines of work; short of both food and transportation facilities, and in imperative need of help from home. Mr. Tanquary, a few days later arrived at Copenhagen and in due course at New York.

In the meantime the supporters of the expedition have engaged the "Danmark," already in south Greenland, to bring out the men this summer, and Mr. Knud Rasmussen has been requested to carry sufficient food in at once for the months preceding the arrival of the "Danmark." This American expedition, whatever may be its final outcome, has fully realized the inexorable conditions of Arctic work, the uncertainty of opposing forces of nature, and certainty that the best-laid plans of work will be greatly modified, if not completely changed; also that the net results, when the history is finally made, will be altogether different from those expected, although perhaps of no less value.

Stefánsson's departure, in 1913, was full of promise. Adopted by the Dominion of Canada, commissioned by it as its first adequate Arctic explorer, he set out from Vancouver on the Pacific coast. The "Karluk" and her two auxiliaries not only were freighted with sufficient supplies and equipment but also carried a scientific staff carefully selected, with each man qualified for his especial department of investigation. Everything, barring the usual minor difficulties, promised well, until, late in the autumn discouraging news came of the separation of the ship from the shore, with Captain Robert A. Bartlett, its navigator, and nearly the whole company on board drifting in the pack, while Stefánsson with three associates, hunting, was hopelessly marooned on land.

The first winter closed in upon this predicament and not until the following May (1914) did Captain Bartlett bring himself to St. Michael, Alaska, with his tale of the three months' drift of the "Karluk"; of her crushing and sinking, late in January, 1914; of the loss of the scientific party and also its supporting party, headed from the ship for Wrangel Island, and of the arrival at this island of the survivors; of his own sledge jour-

ney with an Eskimo over the pack to shore, thence to Emma Harbor, Siberia.

Later the Wrangel Islanders, were taken off by the auxiliary schooner "King and Wing," transferred to the coast guard "Bear," and sent to their homes. Then came Mr. B. M. McConnell back to civilization, with word that having wintered on the Alaskan coast with Stefánsson, after they had been marooned on shore, he had left Stefánsson with two comrades early in April, about sixty miles north of Martin Point, with sixty days' provisions and the purpose of making a reconnaissance, if possible, of unknown land to the north.

The next winter passed in silence, doubts increasing week by week, almost to despair, until nearly a year later Stefánsson himself arrived at Herschel on the north coast of the continent, reporting a most adventurous and successful year. He had journeyed seven hundred miles northward and eastward over the ice,[1] and had been obliged to winter on the western shore of Banks Island, because he did not find there the schooner "North Star," which he had instructed to proceed there and await his return. The following spring he had journeyed over the ice westward and northward. New land was sighted June 18, fourteen miles from camp (N. latitude 77° 56′), of which approximately a hundred miles of coast was defined. Afterward he had made an overland summer march across Banks Island, returning in good order with his comrades to his base. Confronted by what he thought "the unthinkable news" of the loss of his flagship, the "Karluk," he spent no time in vain regrets, and purchasing the "Polar Bear," adapted for his purpose, taking a new stock of supplies and utilizing the fast-waning summer, he set forth again to the unknown North, purposing to winter on Banks Island or Prince Patrick, and then, in the Spring of 1916 to develop to the farthest the possible reaches of the new land mass, intending to return to civilization late in the fall of this year, 1916, or early in the spring of next year.

In the meantime the southern land detachment of the expedition, under the direction of Dr. R. M. Anderson, has been working diligently along the Alaskan coast in the delta of the Mackenzie and eastward toward the Coppermine with encouraging results. When Stefánsson's full narrative shall be submitted to the world, it will doubtless be seen that no expedition has been more fruitful in adventure or richer in scientific reward. Captain Louis L. Lane, in a new, not-yet-named, 300-ton power schooner, left Seattle early this month, hoping to meet Stefánsson two months later at Banks Island, and to bring him and his Arctic sheaves of three years' adventure to home and country.

In the Antarctic the record exceeds,

[1] Of the severe winter ordeal, perhaps this hitherto unpublished letter to General Thomas H. Hubbard, a staunch friend and liberal patron, whose lamented death occurred before its arrival in New York, may be interesting as a human document:

"West Coast of Banks Island, near Lat. 73° 45′ N.
July 1, 1914.

Dear General Hubbard:

I have heard that in dropping a hundred feet to their death men review the sins of a lifetime. We landed here a week ago from a ninety-six day trip across the ice from Alaska, on which (because of accidents near the start) our fuel gave out over forty days before we eventually made land. You will guess that there were times of uncertainty and discomfort, especially when water lanes impeded and contrary currents and winds carried us faster away from land than we could travel toward it, but I hope you will be glad to know that the pleasant memory of your kindness to me in New York when I came home the fall of 1912, was among the most cheering of the mental resources I had to draw upon and that — like the sinner falling to his death — I kept thinking that I had failed perhaps in telling you clearly how much I valued the "vote of confidence" you gave me. Heaven knows when I shall get a chance to send this out of Banks Island, but I hope it will get to you some time to tell you that I at least remember your kindness. We have had much hard luck, but we have finished a trip more difficult than it looks and shall continue to fight misfortune with what courage we have.

[Signed] Vilhjálmur Stefánsson.

if anything, that of the Arctic in interest and mystery. Shackleton's bold and daring project of traversing the great Antarctic land mass was well developed — when the war cloud burst. He tendered his services to his country, but Britain generously bade him "Godspeed" on his scientific quest, and his "Endurance," crossing from London to Buenos Aires, left South Georgia late in the Fall of 1914, for a landing place on Coats Land. Subsequent wireless reports were that the conditions were more difficult than had been expected and that the "Endurance" would be unable to make her way out of the pack before the following autumn (1915) and that the transcontinental attempt must be postponed for a year.

Meantime the "Aurora," Sir Douglas Mawson's staunch steamship, had left Australia for the familiar British Ross Bay base on the opposite side of the continent, there to await Shackleton's advent, sending relief parties inland to lay provision depots for the overland party. More than a year passed in silence, until in March, 1916, New Zealand picked up a wireless message from the "Aurora." Little by little the tragic tale came out, and weeks later, a tug dispatched to her relief brought the ship into port. Ten months before, the "Aurora," with three landing parties at an unknown distance upon the ice barrier, and another of her own on shore, had been torn from the land by storm, and for ten long months had drifted helplessly to and fro. With rudder twisted like a corkscrew and coal exhausted, the plight of the ship was pitiable, and her ultimate salvation providential. While sufficient food is supposed to have been available to support the Ross Bay parties for one season, their fate cannot be known until the Australian relief expedition, which will be dispatched immediately upon the opening of the austral summer, returns.

Remarkable as was the tale of the "Aurora," that of the "Endurance," her consort, and of Shackleton, the leader, is even more extraordinary and possibly tragic. The "Endurance," struggling bravely, finally sank, taking down equipment and nearly all of her stores. A scanty stock, transferred to the ice, enabled the entire party, however, to subsist, until by slow and painful marches they finally reached the limit of the floe, whence in three open boats they committed themselves to the one thousand miles of sea between them and the Falkland Islands. During the perilous journey one of the boats was lost, although it is not yet clear whether those on board perished. At last, Elephant Island was made, whence, leaving his party of twenty-two in a make-shift cave in the ice, Shackleton with two comrades pushed overland to the Norwegian whaling station on the opposite side of the island. Thence, taken to Port Stanley in the Falklands, he communicated to the world his tale of work and adventure.

Little Uruguay promptly responded by the immediate dispatch of a small government vessel, which, picking up Shackleton at Port Stanley, endeavored to reach the marooned party on Elephant Island. On June 19, however, Shackleton cabled that impassable ice barriers had baffled him and that only a more powerful and specially equipped steamer could hope to effect the rescue, and that in the meantime the party must shift for itself as best it could upon reduced rations and what penguins and seals it might, perchance, capture, a discouraging not to say desperate outlook; and here, for the moment, the curtain falls upon what is certain to prove one of the boldest and most fruitless, except in heroism and fortitude, of any of Britain's polar adventures.

A Garden of Germs

MUSEUM OF LIVING BACTERIA A UNIQUE PUBLIC SERVICE

By C.-E. A. WINSLOW

Curator of Public Health in the American Museum of Natural History and Professor of Public Health in the Yale Medical School

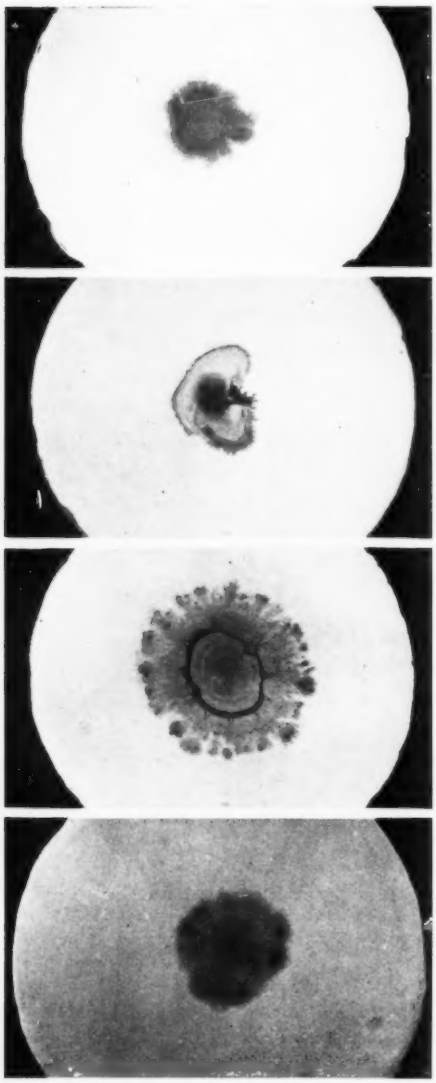
IN one of the tower rooms of the American Museum of Natural History is a strange sort of miniature botanical garden. All that the casual visitor would notice in the large concrete closet which forms the inner sanctum of this unique laboratory would be rows upon rows of test tubes in neatly arranged and classified wooden racks. A somewhat closer inspection would show in each tube a sort of jelly. On the slanting surface of the jelly is what looks like a smear of whitish paste in some tubes, while in others the paste is more abundant and yellowish and in still others it looks like a wrinkled mass of moist brown paper. The smear, or the wrinkled mass, in each case is a growth of microbes, millions of them; and the collection is a museum of living bacteria.

It is a far cry from the whale and the dinosaur, represented by their mighty skeletons in the exhibition halls of the Museum, to the typhoid bacillus, so tiny that 400,000,000 could be packed into a grain of granulated sugar. Yet the bacteria fall within the field of natural history as truly as whale or dinosaur, redwood tree or elephant. Indeed the inter-relationships between microbes and the higher plants and animals are so many that this group is of peculiar interest. Their activity in changing decomposing organic matter into forms suitable for the food of green plants and in fixing the nitrogen of the air and rendering it available for utilization, lies at the very foundation of all agriculture. Bacteria not only cause manifold diseases of plants and animals, but are also the active agents in the decay of foods and other organic compounds; while on the other hand they ripen our butter and cheese, make vinegar and lactic acid, and aid us in a score of other arts and industries.

Germ of anthrax or "wool-sorter's disease," in a drop of blood. In very susceptible animals enormous multiplication of these bacteria takes place in the blood, and the capillaries often become choked with them. In less susceptible animals, such as man, the bacteria remain localized in an abcess or carbuncle at the point of infection and do not permeate the blood stream. *From photo-micrograph presented to the department of public health by Dr. H. C. Ernst*

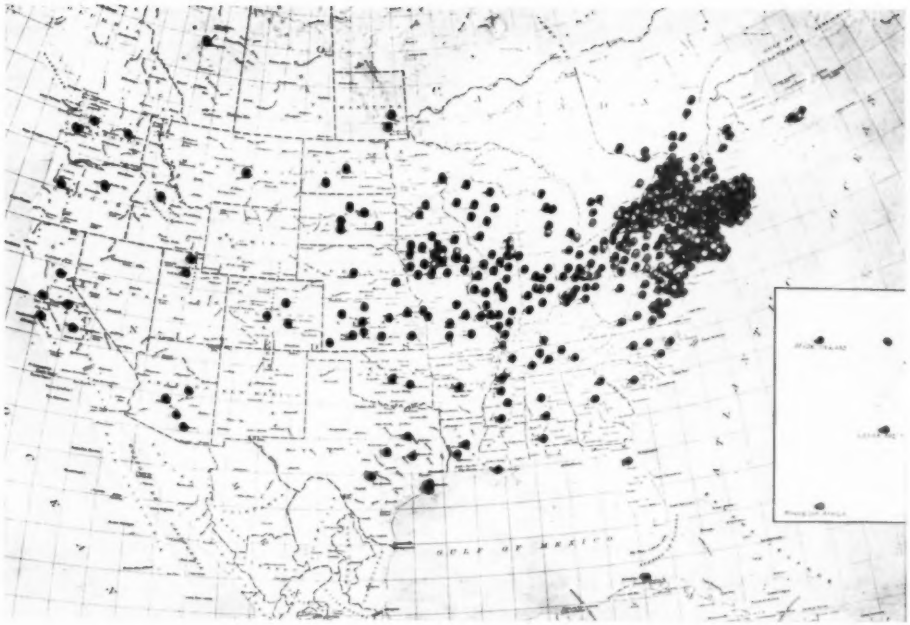
These smallest and most abundant of living things have heretofore never been honored with the recog-

nition of museum authorities. Animals of all sorts can be studied and identified at the American Museum and at the park of the New York Zoölogical Society, higher plants at the New York Botanical Gardens. The discoverer of a new microbe however, has been forced to depend for identification upon comparison with written descriptions unless he could obtain what he wanted from the Kral collection at Vienna, which has never been brought back into a complete condition since Dr. Kral died several years ago. The need for a permanent standard collection of bacterial types has been urgently felt by all workers in this country; and for the last five years this need has been met by the museum of living bacteria, maintained by the department of public health of the American Museum.



Four colonies of living bacteria. Each contains millions of individuals and has grown from an invisible inoculation of the nutrient jelly. In order, from the top, they are: the pink water bacillus, a typical-looking colony, so-called because of the pink pigment it produces when grown on agar jelly; the nitrogen-fixing bacterium, which grows in the soil and assimilates atmospheric nitrogen to serve as food for higher plants; the ray fungus, which produces a cattle disease to which man is also subject; the yellow coccus, a microbe common in the air, which produces a yellow color when grown in a culture medium

Bacteria cannot be dried and put away in trays like bird skins. They are identified, less by their simple structure than by their physiological behavior, by the ferments they produce and the changes set up in the media in which they grow. This collection must be a museum of living specimens and the task involved in bacterial horticulture is no small one. Most bacteria grow on a jelly made up with meat, peptone, and the extract from a Japanese seaweed, agar. Some however, require very special foods, as variously and exactly compounded as those that are prepared in the diet kitchen of a hospital. Some must have egg; some, blood; some, milk; some, salts of special kinds. Some need air while others must be cultivated in tubes from which oxygen has been removed by special chemical means. Some will live for weeks without attention, while others must be transferred to a fresh tube of food jelly every three days. A laboratory helper is busy all the time preparing the culture media for these small but exacting plants, while the bacteriologist in charge is quite fully occupied in transferring them at the proper time, and to the proper medium,

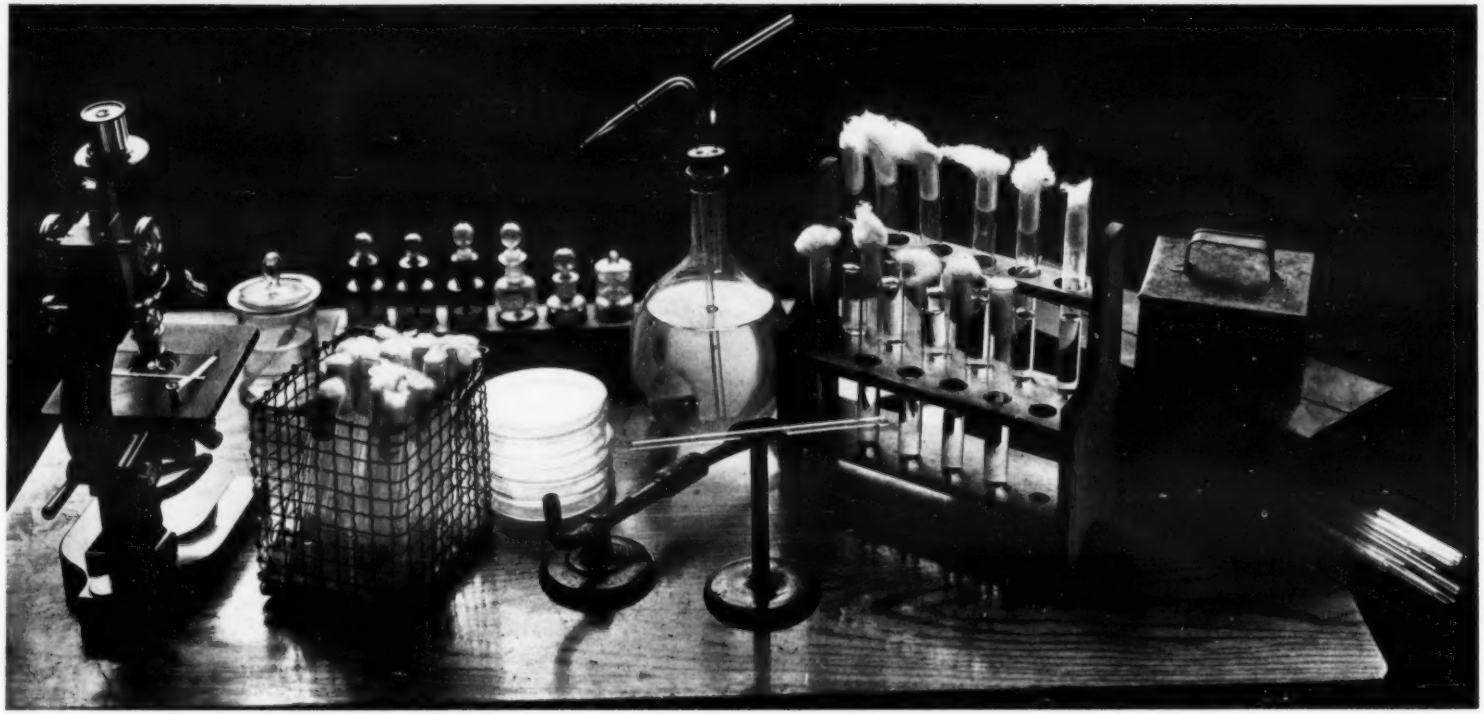


For identification of a new microbe it is necessary to compare its behavior with that of standard types, hence the need of a collection of standard types. Each pin on the map above represents a university, or normal-school, or board-of-health laboratory which has received cultures for study from the American Museum collection

by touching the old growth with the tip of a platinum needle and transferring an invisible, but potent, inoculum to a new culture tube.

There are now about seven hundred different strains of living bacteria in the Museum collection, representing practically all known types of this diverse group. Bubonic plague has alone been excluded, on account of accidents which have occurred in other laboratories with this peculiarly deadly germ. Typhoid and diphtheria germs, however, are to be found, with those of whooping cough and cholera, meningitis and leprosy, influenza and pneumonia, and a dozen more of such pathogenic forms. The original strain of tubercle bacillus isolated by Robert Koch is there, with one of the most recently discovered of disease germs, isolated by Plotz and believed by him to be the cause of typhus fever. In the collection, also, are the bacteria which cause plant diseases and those which decompose foods. There are strains of the Bulgarian bacillus which makes buttermilk and the lactic acid bacteria utilized by the tanner. One germ that infects sugar cane came from Louisiana and another was found fixing nitrogen in the soil of a bean field in the Middle West.

The keeping of records incident to the maintenance of this collection is in itself no light task. For each of the nearly seven hundred types there is a history card with a serial number on which every single transfer to a fresh tube is entered, with the date and the initials of the bacteriologist, so that one can tell at a glance exactly what has happened to each strain since it was added to the collection. The previous history, source, and original date of isolation of the culture is of course kept on file, and a cross index by names makes it possible to find



EQUIPMENT FOR CULTIVATING A GARDEN OF GERMS

The American Museum has a living garden of bacteria (called "germs" or "microbes" especially when used in connection with disease), which are the smallest, most abundant, and collectively most potent of living creatures on the earth. These bacteria cannot be preserved as dead specimens because often the only way to distinguish them is by what they do. A microscope is necessary since bacteria can be seen only when highly magnified and after having been colored with some stain — note the bottles at the rear in the photograph. The wire holder at the left supports tubes of nutrient jelly, some of which contain cultures of bacteria, and others are sterile waiting for a germ to be transferred to them by the tip of the platinum needle attached to the glass rod shown in front. At the right is a rack of tubes containing liquid food, which is often used instead of jelly for identifying bacteria. Some bacteria produce disease; the action of others is made use of by man in many arts and industries

at once any desired type. A third set of cards is arranged by institutions and shows which of our types was received from each laboratory and which has been sent out to each, and on what date.

When a single microbe is planted in a suitable jelly medium it will grow and divide again and again (under favorable conditions once in twenty minutes), till in a few days or weeks there will be a colony, perhaps half an inch across, a city of millions of descendants of the original germ, and of characteristic form, texture, and color. The museum of living bacteria has made it possible to prepare an unusually interesting set of such bacterial colonies of different types, which is exhibited in a window case in the hall of public health on the third floor of the Museum. In connection with the albums of wall charts and large photographs on public health circulated by the public education department of the Museum in the schools of the city, special sets of bacterial cultures have been prepared, illustrating the growth and development of bacteria and their effect upon the various media in which they multiply. Six of these sets of twenty cultures were in circulation during the past year and were used by about one thousand children. Sterile culture plates and media are also furnished to the teachers in the high schools so that they may themselves demonstrate the growth of bacteria on plates inoculated with water or milk, or infected by exposure to the air or by the touch of a finger.

The main object of the bacterial collection is however to furnish standard types for the use of teachers and investigators in other bacteriological laboratories throughout the country. It has been the policy of the Museum to distribute subcultures from our strains as widely as possible to all responsible persons and in all cases without charge. Disease germs are, of course, carefully guarded, being sent only to laboratories of known standing so that they may not get into the hands of unauthorized persons, while special "teaching sets" of typical non-pathogenic forms are sent to the smaller colleges and normal schools for use in class work.

Statistics of the Museum of Living Bacteria

Year	Number of types in collection	Institutions supplied during year	Cultures sent out during year
1911	479	52	615
1912	597	125	1232
1913	637	221	2939
1914	669	314	3218
1915	695	408	3460

The growth of the bacterial collection to a total of six hundred and ninety-five different types, and the development of its distribution to such an extent that in 1915 nearly thirty-five hundred cultures were sent out to over four hundred different institutions, is indicated in the table above, and the geographical range of the service is strikingly illustrated in the map reproduced herewith. Every university and health department of importance in the field of bacteriological teaching or research in the United States or Canada depends upon our service at the present time; and cultures have been sent to Cuba, to Austria, to England, and to South Africa.

Many of the cultures which go out are used for teaching purposes as is shown by the great increase of demands in September and January. It is difficult to overestimate the value of such a service [1] as this to colleges and medical

[1] The general appreciation of this service may, perhaps, be suggested by the following quotations from the many letters, which have been received in regard to it, from representative bacteriologists. Doctor Dorset, of the United States Bureau of Animal Industry, writes, "Your Museum is certainly rendering valuable assistance to laboratories by furnishing authentic cultures

schools which have no facilities for keeping bacterial cultures in condition throughout the year.

Even more important however are the facilities which the Museum collection offers to the investigator. Systematic bacteriology a decade ago was in a pre-Linnæan stage; but it has developed rapidly in the United States during recent years; and scarcely a paper upon bacterial classification can be found in which the types sent out from the American Museum do not play a primary part.

The museum of living bacteria does not however, exist solely for the purpose of aiding other investigators. The curator of the department of public health of the American Museum is chairman of the committee on classification of the Society of American Bacteriologists, and in this connection Dr. Kligler and the other assistants have been steadily at work on the systematic relationships of various groups of bacteria (at present, the group to which the typhoid germ belongs). We expect to make a report on a revision of bacterial genera at the New Haven meeting of the Society next fall. It is hoped that by attacking group after group the whole family of the bacteria, which has presented so difficult a problem in the past, may be mapped out and brought together in a work which shall be as fundamental as the contributions of the American Museum to systematic biology in other fields.

and with so little red tape to be unwound before they can be secured"; Professor Ravenel, of the University of Wisconsin, "The starting of this department is a great help, not only to us, but, I am sure, to all other teachers in the United States"; Professor Lipman, of the New Jersey Agricultural College, "Such a station will meet a long-felt want"; Professor Lyons, of Harvard, "Permit me to say that I think your selection of fourteen organisms for teaching purposes is most happy and that they have proved invaluable in our classes"; Professor Rettger, of Yale, "It is a perfect godsend to have an institution like yours furnish one with cultures of all kinds"; Doctor Hill, of the Minnesota State Board of Health, "I think this is a fine thing and should have been done long ago"; Professor Churchman, of Johns Hopkins, "Such a bacteriological station as yours will tremendously ease the burden of research work; it will make certain studies possible which would otherwise be out of the question and it will make it possible for bacteriologists to work with standard cultures and so to obtain more accurate results. I think that all those familiar with the facts hail the establishment of your department as an advance of great importance"; Professor Sedgwick, of the Massachusetts Institute of Technology, "I feel sure that you will be glad to know how highly we biologists with bacteriological leanings value and appreciate this generous scientific service on your part."

Decorative Value of American Indian Art

By ESTHER A. COSTER

With an Introduction by Mr. Walter Scott Perry, Director, School of Fine and Applied Arts, Pratt Institute

With illustrations from photographs of china decorated by the author

INTRODUCTION: — The art of the American Indians, exhibited in the very remarkable collection in the American Museum of Natural History, furnishes valuable lessons in the fundamental elements of design. These primitive craftsmen felt the principles of design intuitively. Religious symbolism furnished an infinitude of motives. Their art was a means of communicating their emotions, and in it they expressed the characteristics of their race. The first impulse was to produce an article for use and that impulse gave expression to an object which was made beautiful by a creative idea. The decoration of a useful object was always made subservient to the purpose, and refinement of line and beauty of form thus developed with elimination of the unessential. The love of the craftsman for his work so permeates the design that it awakens in the student an enthusiastic response, and stimulates the constructive imagination and creative impulse.

The American Indians possessed a remarkable appreciation for fine space and mass relation, and as a race were characterized by great refinement of feeling and deep religious conviction. The fact that there is a sincerity of purpose underlying every line and motive give their designs a significance that is inspiring in a study of their craft. Beautiful forms common in nature were drawn upon with remarkable skill in selection and adaptation. In fact, nature was the primal source of their art inspiration. Herein lies the suggestive thought for the designer of today. Their motives are always simple, direct, spontaneous, and therefore vital. They are imbued with life and movement. Remarkable versatility is shown in the use of the limited amount of material at their command. By working out the designs in the material itself, they preserved the organic structure of the design and displayed wonderful ingenuity in developing their motives in restricted areas.

The Indian designs are illustrative of principles that lie at the foundation of all design. Repetition, symmetry, rhythm, straight and curved line arrangements, light and dark, space relations, color values, are carefully related and produce patterns of simple beauty and artistic merit. The straight-line pattern was the most commonly used, being especially adapted to borders and forming the decoration on wearing apparel, pottery, utensils, and objects relating directly to their everyday life. To the Indian, stability and strength were qualities that stood for superiority of type, and these elements are characteristic of their art expression. The elemental forces — fire, air, and water — were expressed in a well-ordered symbolism. Each beautiful ornament is derived, whether intentionally or unintentionally, from some constant natural form which has made its appeal as a divine creation.

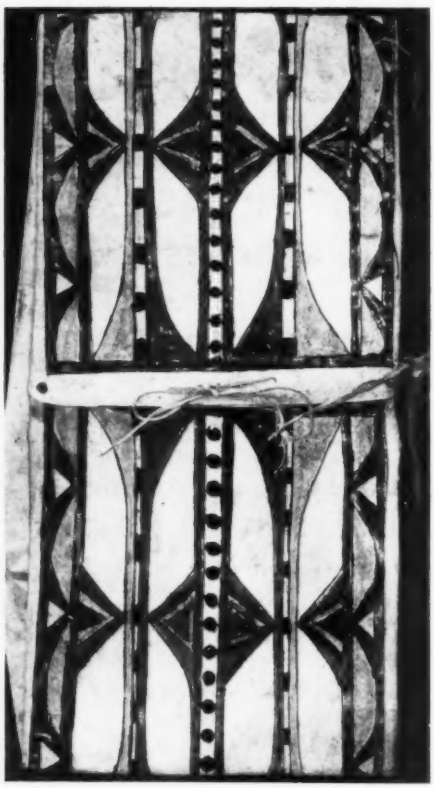
WALTER SCOTT PERRY

COMPARATIVELY few people, even among art students, have any adequate realization of the wealth of material which awaits the seeker for new ideas in the American Indian collection of the American Museum of Natural History. Too many visitors look upon the Indian exhibits as curious and interesting without appreciating the possibilities of adapting the motives to the modern crafts. As from all primitive art, it is necessary to choose the best, but the simplicity and directness of expression, even where the execution is crude, hold many valuable lessons for present-day designers.

The Indians drew their inspiration directly from nature, using familiar forms but interpreting them in so simple a fashion that the resulting motive be-

came a true art expression. The favorite mode of decoration was the border, which appears in great variety. Most of the surface coverings, except those of the Alaskan tribes, are really a combination or repetition of borders. These designs are mostly arranged in straight lines, the weaving of beads, fiber, or grass, making this style of ornament necessary. The Iroquois sewed the beads on to the material and so could use the scroll in their designs. In all these Indian designs the units are well planned, well spaced, and wonderfully accurate in execution.

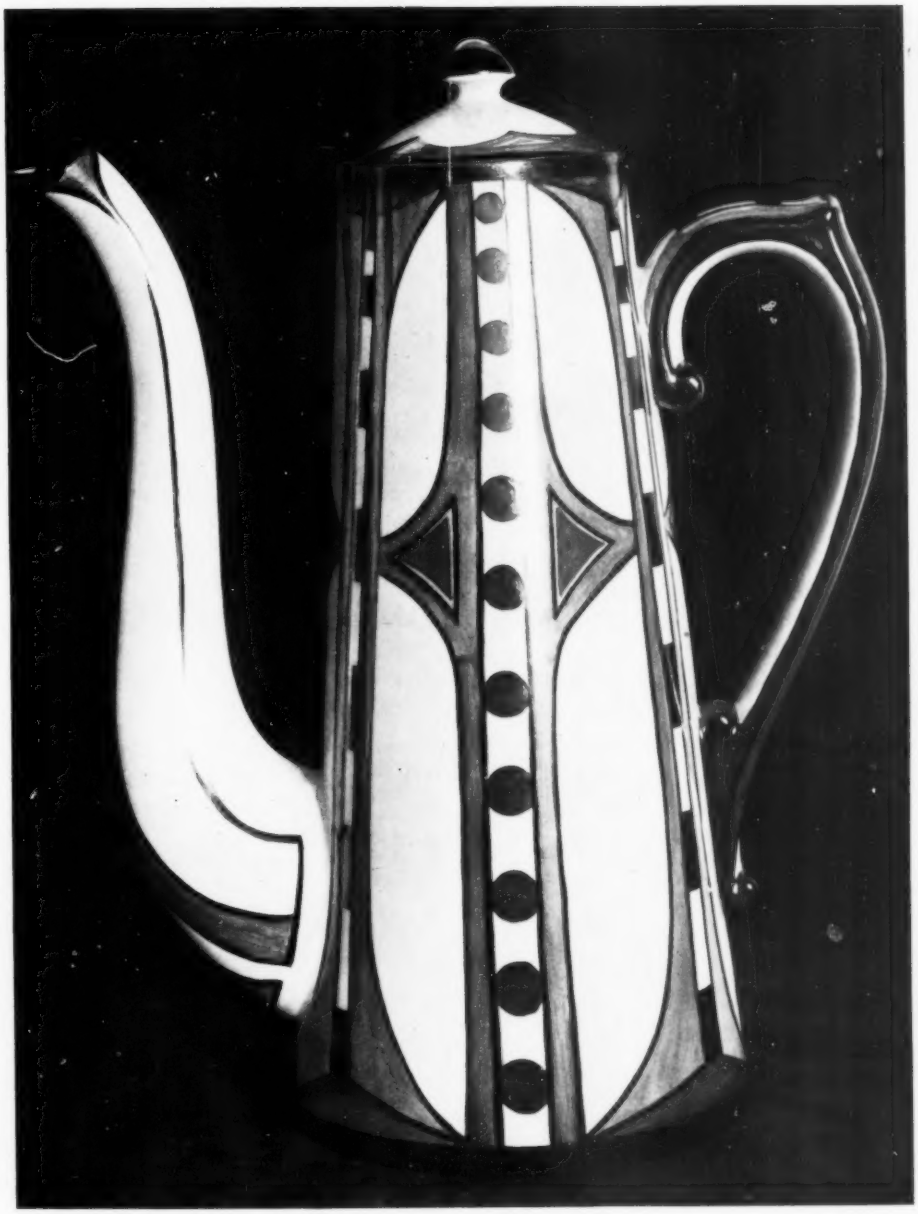
Sometimes a single motive was used as decoration, many of these being very beautiful in shape and each symbolic of a natural form. In a few cases a number of units, usually differing from one another, were scattered irregularly over a surface, but so far as I have observed, the Indians did not use a repeating pattern as in our own fabrics and wall papers. The Alaskan tribes covered the whole surface with motives set closely together, but these were irregular in shape so did not follow any definite rules of surface design. The Pueblo pottery and baskets are often fairly well covered with decoration, but the design is more in the form of a rosette or wide border.



The Indian made every object for use but always put into its construction original ideas of decoration in both design and color. This folding raw-hide bag made by the Hidatsa-Mandan, is decorated with a design of straight and curved lines, and in shades of green, orange, black, brown and blue

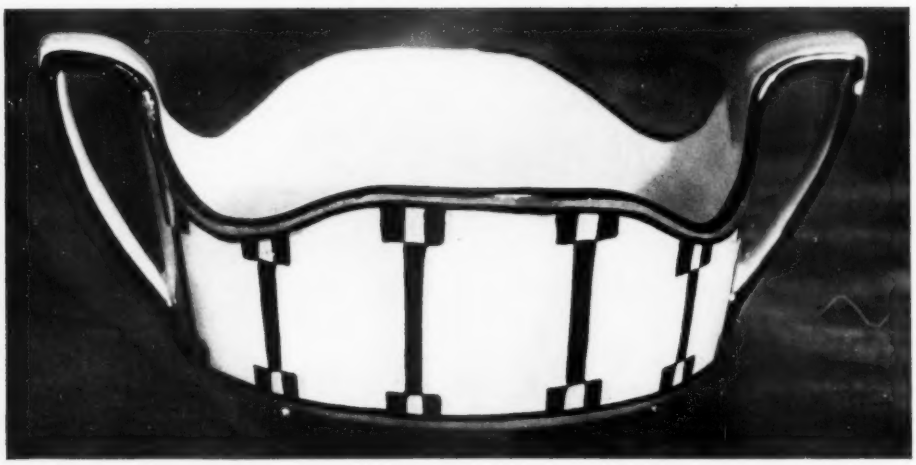
The rosette was much used, both as a decorative motive by itself and elaborated to cover a surface. The painted skin robe in the Dakota collection is a wonderful example of the rosette form. The proportion of the different sections of the design is subtle, and shows an appreciation of rhythm and symmetry. The color also is especially fine in this example. The decorative rosettes of beads or colored quills are of interest from the skillful arrangement in them of lines and spaces.

In pointing out practical steps toward utilizing the Indian exhibits, it will be easier to consider the several classes of craftsmen and the especial needs of each. First, the needleworker: For cross stitch embroidery or crocheting, there are hundreds of designs that can be copied without any change except the choosing of colors suitable for the work. The woven bead patterns are the simplest to copy. All the Eastern and Plains tribes have fine examples. For more elaborate work in a different style the bead patterns in flower motives will be found effective, and are suggestive of Persian brocade patterns, but simpler in line. The straight line animal forms of the



Design reproduced from that on Hidatsa-Mandan skin bag (see preceding page), in rich and contrasting although subdued coloring. The simplicity and directness in Indian design hold many valuable lessons for present-day designers, and painted skin bags and robes provide unusually inspiring motives for modern work, especially perhaps for the worker in leather and various fabrics. The American Museum offers a vast wealth of material in Indian decoration for the student of modern design

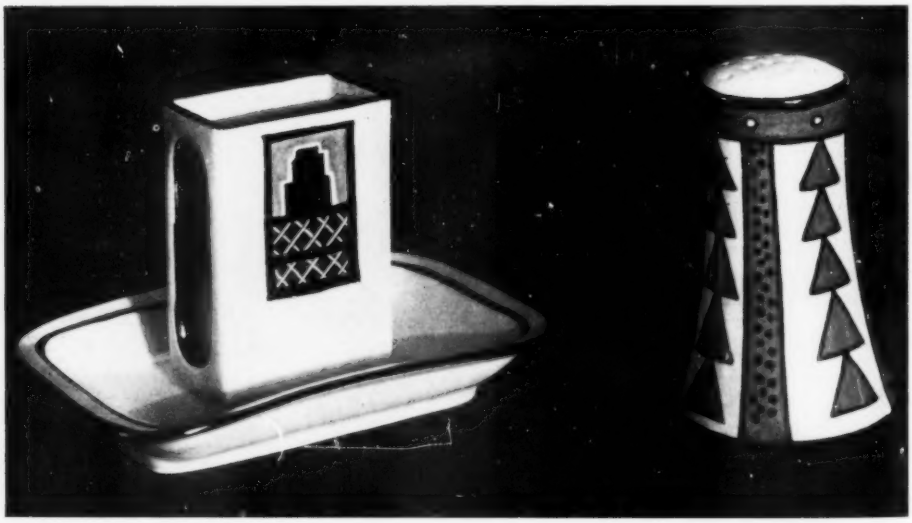
Sauk and Fox would be fascinating for nursery linen, and are similar in character to the well-known Coptic embroideries. To the worker in appliqué, or "glorified patchwork," the silk appliqué of the Menominee Indians, although rather crude in execution, will be most suggestive. The embroidery of the Hopi



Sugar bowl decorated with motive found on a beaded belt made by the Sarsi Indians. Much of Indian design uses only the straight line which was best adapted to work in weaving with beads, fiber and grass

and Zuñi tribes is very different from the usual work of today, but with its well-planned motives, its simplicity of treatment, and its interesting stitches, it is an inspiration to the earnest student.

For the worker in leather, or other fabrics to which ornament is applied, the bead decorations will give many ideas for design but the quality of line may need to be modified to suit the medium of expression. The painted skin bags and robes will be most inspiring for this work. The simplicity of the motives and the interesting method of application will be a revelation to the student unfamiliar with Indian art. The effect of the foundation showing through the rather thin color gives a transparency



An embroidered blanket of the Hopi Indians furnished the match box design, and that of the pepper pot came from a large two-handled water vessel of the Pima tribe. The reproductions unfortunately do not show the colors of either object or design, which play so strong a part in the whole artistic result

that is far more artistic than the hard solid color applied to so much of our modern fabrics. The effect is much more like block printing, although there is no evidence that the Indians were familiar with that process. The black is a peculiarly attractive tone, "rusty" describing it as nearly as words can. It has a much softer effect than our commercial black and is well worth copying. The white is a dull gray white which is beautiful to look at but most difficult to duplicate. The preponderance of these two colors harmonizes the variety of bright colors used in Indian designs.

The patterns shown in the Indian weaving, whatever the material, are wonderfully suggestive to the designer of textiles. There is not the variety of motive found in the Persian and Italian textiles but there are strength, simplicity, and fine proportion. The texture of the fabric itself, especially the best of the Navajo blankets, makes a humiliating contrast with the flimsy weaves of our modern looms. Some of the coarser weaves shown in the bags of the Woodland tribes, would be well adapted to materials for bungalow furnishings. The woven bead bands give many suggestions

This design of black spikes upon a bright yellow ground was obtained from a Pawnee skin coat, decorated with quill bands on the shoulders and down the front

The design represented on the cup and saucer was taken from a beaded bag of the Plains-Cree. Indian art is full of suggestions for the modern craftsman, whether he be a needleworker, worker in leather, in metal, in keramics or pottery, or a designer of textiles

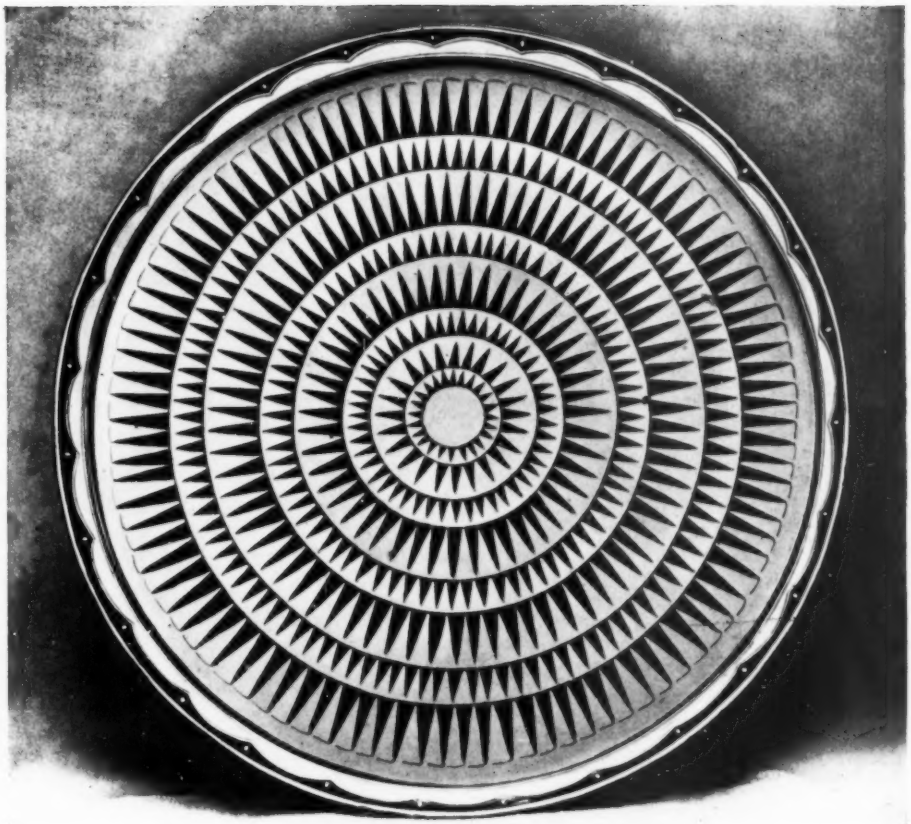
for patterns which may be borrowed entire, and could be used for rugs, or even for dress trimmings.

For the worker in metals, the decorative rosettes will be especially helpful. The craftsman must consider the limitations of his medium, but many of the rosettes offer beautiful shapes for jewelry. The well-spaced lines of the motive insure an interesting design without further ornament, which is not always true of commercial jewelry. The attempt to cover poor design by adding jewels, which in themselves are always beautiful, is a pitiful display of inefficiency. The Indian pottery is often crude in execution, but the shapes are wonderfully well conceived. The simplicity of form is well worth studying, and for the worker who models his own shapes there are many suggestions. There are comparatively few examples with handles, but the pieces, especially the bowls, are well proportioned and show a subtle feeling for curvature.

This elaborate all-over design on a tall candlestick was originated by the Tlingit Indians for a painted paddle. In the adaptation of Indian design to modern art, suitability to the new material and medium and to the size, shape and use of the article must be considered

For the keramic worker there are absolutely limitless possibilities. For the potter there are suggestions both for shapes and decoration. The use of natural clay with the decoration in soft dull colors might open up a new field. The pottery workers have developed wonderful glazes and colors, but a careful study of the Pueblo pottery will reveal a beauty in the simpler method. The decorations are often remarkably well planned and the fret ornament of the Utah tribes is as beautiful as the Greek, although not as good in technique. The Zuñi designs are more in accord with modern lines of thought, and show a freedom of handling that is refreshing compared with some of the over-decorated commercial pottery. The Indian motives lend themselves especially well to tiles for walls, floors, or mantels. Some of the woven patterns could be reproduced for floor tiles with artistic effect.

In selecting designs for any craft, a few general principles must be followed.

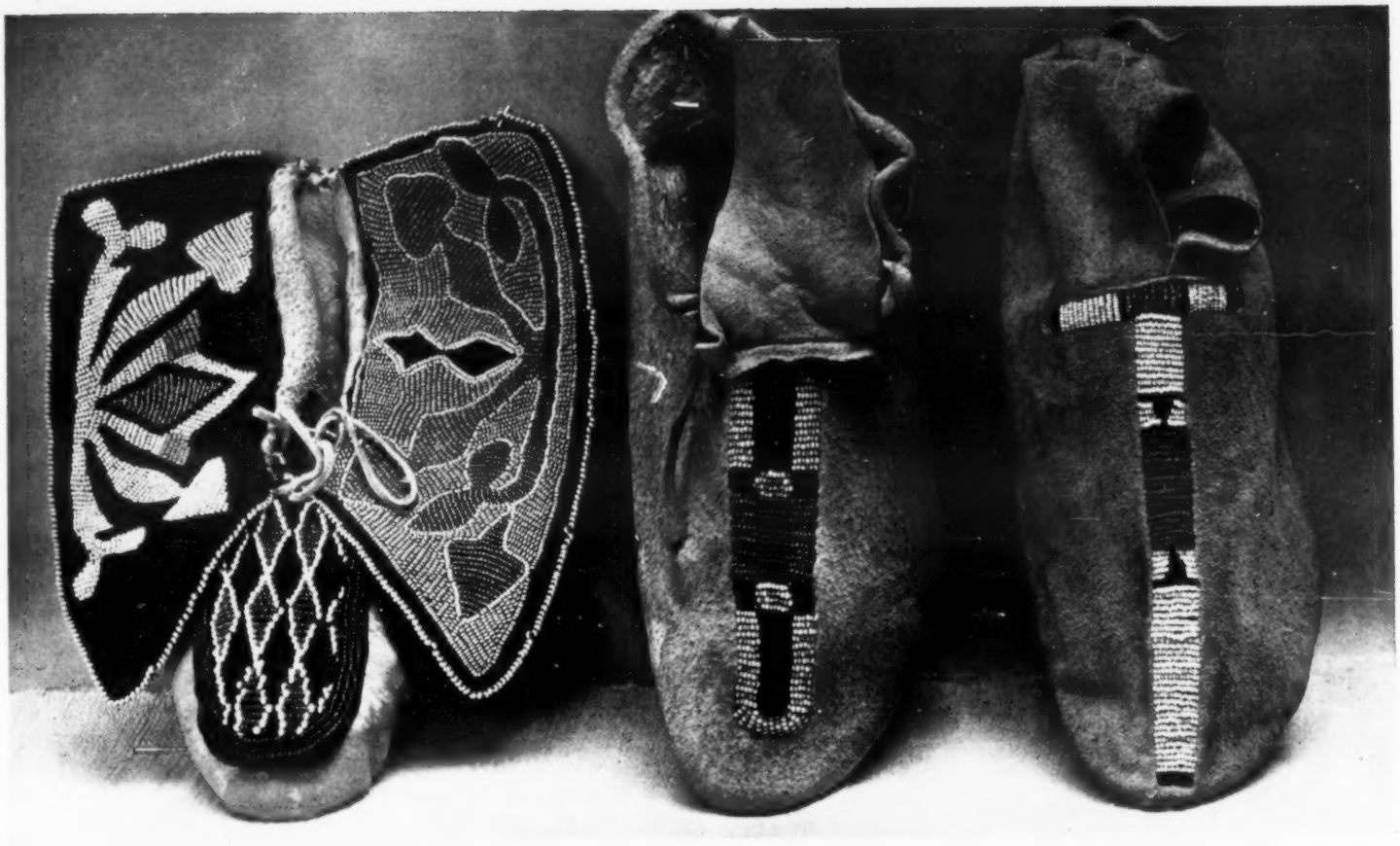


Very large china tray, with design in red and blue adapted from the decoration on a painted robe of buffalo hide made by the Dakota Indians. The rosette was much used by the Indian, showing unconscious appreciation of rhythm and symmetry in design, and is one of the many instances where he took his motive direct from nature

which may be classified as follows: First, the artistic value of the original example; second, the suitability of the design to the material and medium to be used; third, the suitability of the design to the size, shape, and use of the article to be decorated; and fourth, the addition of the personal element in the adaptation of the design.

If these principles are rigidly followed the Museum exhibits will prove of inestimable value, and will open the way for the development of a truly American art expression.

In adapting Indian motives the primitive spirit must be retained or the result will be a disappointment; but a reversion to the simplicity and free expression of Indian art is what modern craftsmen most need to counteract the tendency to over decoration, mechanical technique, and lack of individuality.



MOCCASINS OF THE WINNEBAGO AND ARAPAHO INDIANS

The American Museum has the largest moccasin collection of any institution in the world, and the new exhibit shows several hundred type specimens from northern countries. (The moccasin is found only in the home of caribou or reindeer.) A study of the exhibit shows how the design and decoration arose directly in the particular pattern devised, and study with a map reveals how the various styles migrated from tribe to tribe over the country. The Winnebago moccasin at the left is made top [illegible] piece and the front decoration hides a seam. The two others, Arapaho moccasins, have a rawhide separate sole and the upper in one piece with therefore no seam in front, yet the same style of decoration appears as in the Winnebago and has probably been borrowed

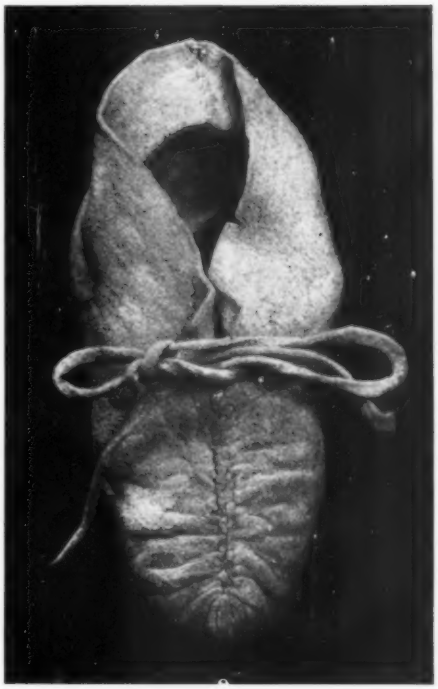
Moccasin Exhibit in the American Museum

By CLARK WISSLER

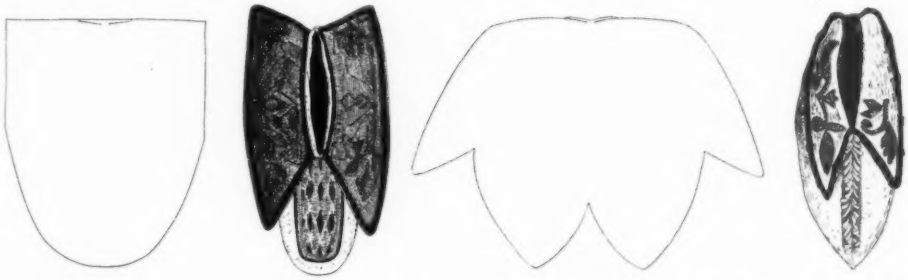
A SPECIAL moccasin exhibit has been placed in the center of the Eastern Woodland Indian hall of the Museum. Two points are shown by it: the principal moccasin patterns and their distribution, and also the relation between the style of decoration and the structure, or cut. This is not offered as an exhaustive treatment of the subject, but as an introductory guide to the study of footwear in general as shown in all parts of this and the adjoining halls.

As far as we know, this Museum has the most extensive moccasin collection in the world. From many tribes we have in our storage collections large series presenting all the varieties of pattern and decoration. From these many hundred examples, type specimens were selected for our exhibition halls, where they give an adequate exposition of the primitive skin shoe.

The regular Museum visitor will find these moccasins an interesting subject for study. As the collections in our halls show, the true moccasin is almost confined to Canada and the upper two-thirds of the United States. In Mexico and southward into South America, it does not occur so far as our data go. In Siberia and even in the European Lapland, we find a similar skin shoe or boot,



The true moccasin is usually made from a single piece as shown in this undecorated baby's moccasin of soft deerskin. This moccasin was cut after the pattern shown at left below. The most skillful maker cannot avoid a somewhat unsightly puckering at the sides of the seam



One-piece moccasin patterns. The flaps of the left-hand moccasin are additions to the pattern, and in the right-hand one the seam is carried over the toe to avoid puckers. Decorations on the front of the moccasin were evidently originally designed by the Indians to cover the seam

THE STYLE OF HUDSON BAY COPIED BY THE BLACKFOOT

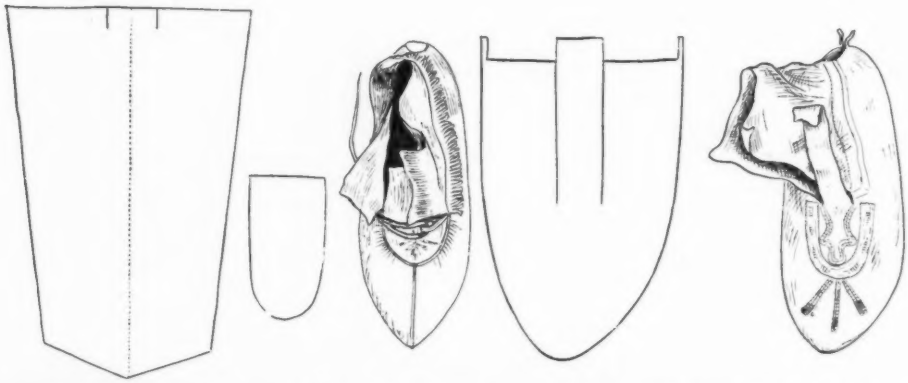
Indian garments furnish many instances in which a style or decoration, originally designed to serve a special purpose, has become permanent and continues to be used when it serves none but a decorative end. Indians of Hudson Bay and Western Canada use a two-piece moccasin, made from pattern at left on page 312, sewing in the U-shaped insert with a curved seam. Since trade days the Indians have followed the custom of covering this insert with velvet or broadcloth as shown in the middle moccasin. The Blackfoot Indians, south of these tribes, have a moccasin with a separate sole and smooth one-piece top (after pattern at right on page 312), thus with no U-shaped insert, yet they go to the trouble of putting on a decorated U-shaped patch in imitation of the style of their neighbors (moccasin at left). In the design on this moccasin is the Blackfoot's symbol for the aurora, the "white man's dance fire"

they go to the trouble of putting on a decorated U-shaped patch in imitation of the style of their neighbors (moccasin at left). In the design on this moccasin
Blackfoot's symbol for the aurora, the "white man's dance fire"
310

MOCCASINS OF THE APACHE AND SIOUX

The Apache have a moccasin pattern (shown on page 313) consisting of a one-piece upper attached to a hard sole. A slit in the upper provides for the insertion of a very narrow V-shaped piece, which is generally painted and often fringed as in moccasin at the left and perhaps also beaded as in the middle specimen. This scheme of decoration has appealed to the Sioux who live north of the Apache, and they use paint and beads and sometimes fringe in a similar design, although having no insert to suggest the motive

The moccasin at the right is made after the right-hand one-piece pattern on page 309 (although the puckering is carried over the toe and under the foot to leave the top smooth), and the fringe and beaded border cover the seam. The Sioux moccasin on the left has a separate sole with a single-piece upper and consequently no seam in the midline on top, notwithstanding which its maker has utilized the beaded border and middle fringe idea of decoration

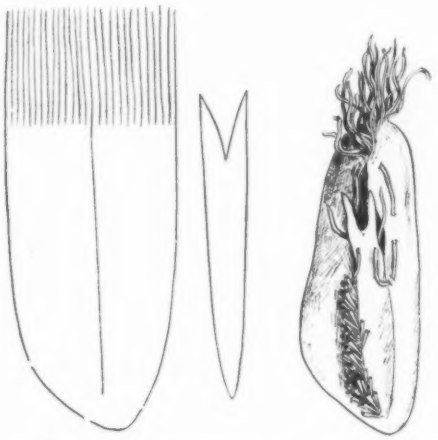


At the left, pattern for moccasin with U-shaped insert, used by tribes around Hudson Bay and in Western Canada. At the right a Blackfoot pattern to be sewed on to a sole. This may be given a separate U-shaped decoration like a false insert, in imitation of the other

and if we consider the whole of the Old World we find the leather shoe and boot strictly confined to the northern part as was the case in the New World. In both hemispheres, sandals are found among the peoples next south of the shoe wearers, and still farther south, in Africa, Australia, and lower South America, barefooted peoples are found.

In the New World the area of the moccasin is also the area of skin clothing, while the area of the sandal is where woven cloth prevailed. Practically the same relation obtains in the Old World. This curious parallel has been remarked upon many times as due to climatic differences, skins being indispensable in the far north and unendurable in the south. Yet, this can scarcely be the whole story, for leather shoes are far from being a burden in warm countries. The probabilities are that the absence of leather or skin footwear in aboriginal textile areas is due to the difficulty of maintaining textile and skin dressing arts simultaneously. We must remember that it is but yesterday since cloth was essentially homemade by the housewife and if we go back still further, so was the dressing of skins. But nowhere in the world of uncivilized peoples do we find the women extensively carrying on weaving and skin work simultaneously to an equal degree. One or the other predominates. There was no doubt a limit to the trades a woman could master and since there was nothing like modern division of labor, only the one of these arts best adapted to the climate would prevail. So when a people came to be wearers of textile clothing, they would not make skin or leather shoes.

While the moccasins of our Indians appear to the casual observer as of great variety, a little analysis will show a few common structural features. Among these are the manner of tucking in the surplus skin over the instep and the method of lacing. Now these same features are found in Siberia, and definitely raise the question as to one having been borrowed from the other. Since the skin-shoe-wearing natives of Siberia were in contact with the natives of Alaska, there is no good argument against their common origin. The most natural explanation of the observed similarity would be that this type of shoe was perfected in one place and from thence distributed as we now find it. A careful comparison of the shoes in our collections will suggest the direction in which they traveled.



Pattern for Apache moccasin, with sole separate as in a shoe. The upper is cut nearly its whole length to receive a narrow V-shaped insert, which is usually painted as well as decorated at its edges with fringe and beads.

A point of more general significance may appear if we consider the kinds of skins used for clothing. The predominant kind is reindeer in the Old World and caribou in the New, two closely allied species. If we take an outline map of the world and indicate the respective ranges of these animals, we shall have in the main the area of skin clothing. It thus turns out that the skin shoe is a correlate of reindeer culture, a suggestion that will no doubt

offer new problems to the investigating visitor.

The decorations found upon footwear present even more interesting problems, for we see from the exhibit that certain styles and even designs had their origin in the structure of the moccasins, but that when over-developed they were borrowed by people using other patterns. We are thus able to discover how certain decorations were devised and also to trace their migration over the continent.

For example, the true moccasin is usually made of a single piece of skin as shown in the baby's moccasin figured on page 309, the pattern for which is shown below it at the left. The shaping of the piece to the foot results in a puckered seam down the top of the moccasin, which is inclined to be unsightly even at the hands of the most skillful seamstress. It is not strange therefore that one finds this part of the foot overlaid by a piece of beaded skin (see page 308). Such an ornamental patch will conceal all the unsightly lines and give a fine field for decorative design. In the eastern part of the United States where this pattern of moccasin was prevalent, such an overlay is frequently seen, but farther west in the Plains we find moccasins made in a different way, yet some of them bear a band down over the foot as if they were also hiding seams beneath, whereas in fact there is no seam whatever.

A slight variation of pattern is shown at the right in the figure on page 312 where the seam is carried over the toe and under the foot. The point here is that a smooth seam is secured without the puckered effect. The decorations can now be a narrow band along the seam, but usually a fringe is added. To the left is a Sioux moccasin, the upper of which has no such seam, yet upon it is sewed a fringe with a beaded border, giving the same effect.

Another type of moccasin found around Hudson Bay and westward in Canada is shown on page 310. Its pattern is indicated at the left of the figure on page 312, a single piece of skin being so folded as to cover the foot just over the instep, where a U-shaped insert is placed. The sewing in of this insert results in a bold curved seam. The decoration is placed along this seam and on the U-shaped insert. Since trade days it has been customary to overlay this insert with broadcloth or velvet, as shown in the moccasin in the middle. Just south of the Indians using this style live the Blackfoot who use a moccasin with a separate sole and the upper in one piece as shown in the pattern at the right on page 312. They decorate this one-piece upper however, as if it had the U-shaped insert, as shown in the left-hand moccasin. It is clear that the intent is to make their moccasins appear like those of their northern neighbors.

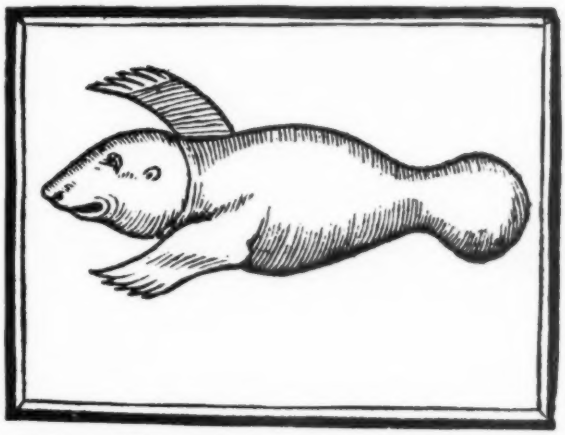
Still another example may be cited. On page 313 we see the pattern for the Apache. This moccasin has a sole like a shoe, but the upper is split almost to the toe and a long narrow insert sewed there. Just what may be the purpose of this is not clear but it determines a style of decoration. The insert is painted and fringed at one side as shown at the left on page 311. North of the tribes using this pattern are the Sioux and Cheyenne, who frequently adorn their footwear as at the right. This moccasin has no insert but the beaded bands are in place and the space between them painted.

The point in all this is that these styles of decoration first developed not out of nothing but as correlates of the structural pattern. They first served some real use, but once established as styles, were carried over to footwear of other patterns where they serve no function of the structure.

Sea Cows, Past and Present

By FREDERIC A. LUCAS

JUST why the manatee, the first sirenian known to Europeans, should have been called a "sea cow" (*Vacca marina*) is hard to say; possibly because its flesh resembled beef, certainly not because its form was in any way like that of a cow. It has also been suggested that it received this appellation on account of the style of its teeth, the character of its food, and its manner of browsing on water plants. There was a belief with many that everything on land had its counterpart or analogue in the sea, and when one is looking for resemblances, they are generally to be found. Thus, the ordinary seals were sea wolves; the fur seals, sea bears; while other animals did duty as sea dogs, sea horses, and sea elephants.



This figure of the manatee occurs in Oviedo's *History of the Indies*, 1535, and is the earliest known representation of the sea cow. One species of manatee inhabits the rivers of western Africa, another those of northern and eastern South America and parts of Florida

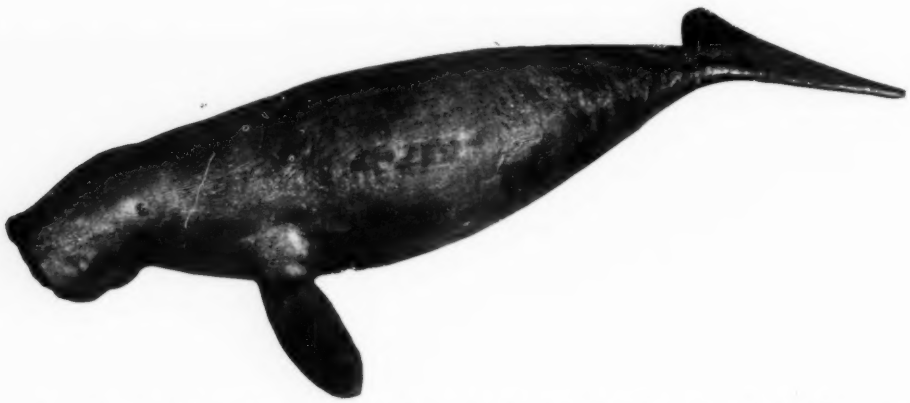
At first sight one would hardly think of the chunky clumsy sea cows as in any way connected with myth or fable, or as having contributed aught of interest to the pages of history. Yet for a family numbering so few members, and those of retiring habits, there is — save the elephants which naturally could not be overlooked — no group of animals so often mentioned in myth and history.

In the first place the dugong, the sea cow of the Red Sea and African coast, has a good claim to be considered the original mermaid. True it does not look the part, when seen too near; but when the Arab traders cruising down the Red Sea, or on their way to Madagascar, caught glimpses of the round head of a dugong peering above the waves, or perhaps saw a mother with her baby tucked under her arm, they not unnaturally thought of them as having some human attributes. Thus, from saying that they looked like men, it was a short step to saying that they were men. A seal does not look much like a man, and yet anyone who has seen a seal's head bobbing above the waves will know how strong, under these conditions, is the resemblance of the seal to a human being. A little imagination is a great help in "seeing things" and the creation of the mermaid would seem to lie between seal and sea cow, Norseman and Arab — with the odds in favor of the sea cow, since the seal was already bespoken for the sea wolf.

Another claim to distinction possessed by the dugong is that its hide is believed to have been that used by the Israelites to cover the Ark of the Covenant, the

word usually translated "badger," really meaning some kind of a sea beast, a fact — or belief — embodied in its scientific name *Halicore tabernaculi*.

An incidental point of interest about one of the sea cows found in the rivers of northern South America is that its flesh might be eaten on fast days, as it was considered by the Catholic Fathers to be a fish. This lack of zoölogical knowledge is hardly to be wondered at; we are all apt to judge by appearances, and (with apologies to Pliny and Aristotle) systematic zoölogy was an unknown science in the days when the code was drawn up, and even today we are called upon to tell the position of the bat and explain why a porpoise is not a fish.



Dugong, or sea cow of the African coast and Red Sea. Its skin is smooth and leathery, unlike that of the rytina or manatee, and it has two tusks deeply imbedded in the skull. The bones of all sea cows are extremely dense, their weight serving the purpose of the ballast tanks of a submarine, enabling the animal to browse readily on aquatic plants. The skeleton is lightest in the seagoing dugong, but even in this species the bones are heavy compared with those of land animals. [*From photograph of dugong model, seven feet in length, in the American Museum*]

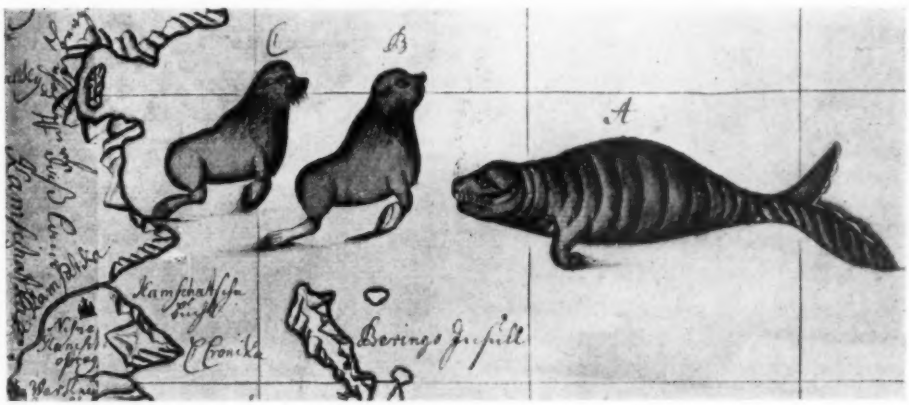
Perhaps the most interesting as well as the largest member of the sea cow family, is the great Arctic sea cow, or rytina, once found about Bering and Copper islands off the coast of Kamtchatka. This species is the least known — because it was long ago "eaten off the face of the earth by gluttonous man." Strange it is to find the largest members of a family whose natural home is in tropical waters, dwelling in the icy seas around the bleak shores of a barren island; another illustration, like that of the mammoth, of the danger of concluding, because a group of creatures is now found in warm regions, that all of its kind have lived there.

When Bering, in 1741, discovered the island now bearing his name, he happened upon one of the abiding places of the fur seal and also discovered the rytina. It was made known to the reading world by Kipling in his story of *Kotik the White Seal*, which is as good as a story as it is poor as natural history. There is this compensation however — had it been truer to nature, David Starr Jordan would not have written *Matka and Kotik*.[1]

At the time Bering discovered the Arctic sea cow, Alaska was the source of a most important fur trade, due largely to the then abundance of the valuable sea otter, and thither sailed the Russians from Petropavlosk. Provisioning the

[1] *Matka and Kotik.— A Story of the Mist Islands.* A charming tale written by Dr. Jordan in order to show that it is possible to combine accurate natural history with literature.

vessels was none too easy a matter and salt beef was especially difficult to procure; so when the rytina was found and proved to be most excellent beef, the fur traders stopped at Bering Island on their way to our Northwest Coast to lay in a store of salt rytina. Unhappily the supply of rytinas was limited, owing to the limited number of proper feeding grounds, and so before many years the animal was eaten out of existence. Dr. Leonhard Stejneger, who passed two years on Bering Island, during which time he gathered many valuable



The great Arctic sea cow or rytina (see right of picture) discovered by Bering in 1741, was the largest member of the sea cow family, and once abundant about Bering and Copper islands off the coast of Kamtchatka. It is now extinct, having been hunted for its flesh which resembled beef. Our only figures of the animal are these on the chart of Kamtchatka made by Lieutenant Waxell of Bering's party. The creature is said to have been so helpless that it was rolled about by the surf and banged against the shore, and its hide — no doubt for protection — resembled bark and was so thick that it was hewn off with axes

sea cow skeletons, estimates that at best there could not have been more than two thousand individuals.

For our knowledge of the rytina and its habits, we are indebted to Steller, the surgeon of Bering's party, an enthusiastic naturalist, who in the midst of starvation, disease, and death, carefully studied and recorded the habits of the animals of Bering Island. Our only figures of this extinct animal are those made by Lieutenant Waxell, of Bering's party, who, following the custom of the old cartographers, decorated his chart of Kamtchatka with figures of the sea lion, fur seal, and rytina. But for this we should be in doubt as to the tail fin of the animal, since Steller's description is far from clear; also we might wonder if Steller was correct in saying that there were no finger bones in the paddle, since other members of the family have them.

Scientifically, the sea cows are interesting because they afford one of the instances where a theoretical ancestor has duly materialized. All aquatic mammals, seals, sea cows, and whales, are believed to be descended from four-footed, land-dwelling forms, whose remains are imbedded somewhere in the rocks. So far none of these hypothetical beasts has come to light and the palæontologist is compelled to fall back on the "imperfection of the palæontologic record." The fact is we really know little of what lies buried in the rocky tombs of the past, and not only have we no continuous record of the life of other days, but also only rarely

do we get even so much as a connected chapter, most of our knowledge being based on scattered pages or odd sentences torn here and there from the book of time.

Anyone who has seen a fur seal in his native haunts has no difficulty in believing him to be descended from some bearlike beast; but it seems a far cry from a sea cow, or a fishlike porpoise, to any land-frequenting quadruped, and the best evidence we have so far lies in the traces of the hip bones and small vestiges of the limbs, which, though buried in the body, still lie where they should if they are the representatives of former limbs.

It would of course be one link in the chain, one step toward a four-footed animal, if we could find a four-paddled porpoise, but none has yet come to light, and here is where the sea cow comes forward with an important bit of evidence. When palæontologists were hunting in the Fayum, Egypt, for ancestors of existing elephants, they came upon remains of a manatee, not unlike those of today, save that it possessed four well-developed paddles; and because it was so evidently the predecessor of the modern sea cows, it was named *Eosiren*.

Today the sea cows are a scattered race; one species of manatee inhabits the rivers of western Africa, another those of northern and eastern South America and parts of Florida. One dugong occurs on the east coast of Africa and in the Red Sea, while a near relative is found on the northern coast of Australia where it is hunted for its oil.

Those interested in sea cows from a zoölogical standpoint will find that they display considerable diversity both externally and internally. Thus, the dugong is clad in a smooth leathery skin; the hide of the manatee suggests that of an elephant, while the covering of the rytina is said by Steller to have resembled bark, being so thick that it was hewn off with axes. Steller also says that the creature was so helpless that it was rolled about by the surf and banged against the shore, so it would seem that such a hide was a necessary protection.

The dugong has a broad forked tail, not unlike that of the porpoise, while the tail of the manatee is rounded. The rytina was absolutely toothless, while the manatee has, during its lifetime, a series of eleven teeth on either side of each jaw, and these are replaced from behind, as in elephants, and not from below, as in the vast majority of mammals. The dugong has two tusks so deeply imbedded in the skull (which is bent sharply downward in front) that they seem of little practical use.

In one particular all known sea cows agree; their bones are extremely dense, being almost ivory-like in texture in our own manatee. In this species too, the ribs reach their maximum size, being so large as almost to touch one another, with the result that the skeleton is extremely heavy. This weight of bone is believed to serve the same purpose as the ballast tanks of a submarine and to enable the animal to browse readily on aquatic plants. The skeleton is lightest in the sea-going dugong, though even in this species the bones are heavy in comparison with those of land animals.

The lungs, in the manatee at least, are long and narrow, and though of small capacity suffice to keep the animal afloat so that the nostrils are just above water. Aside from these more apparent characters, there are peculiarities of heart, backbone and hip bones which are of more interest to the anatomist than to the average observer.

"Men of the Old Stone Age"

By G. ELLIOT SMITH

Professor of Anatomy and Dean of the Faculty of Medicine, University of Manchester, England

IT is only sixty-eight years since there first came to light a skull that can be called really old in the geological sense. Lieutenant Flint, of the Royal Artillery, found this historic specimen in the Forbes Quarry at Gibraltar in 1848, and presented it to the Gibraltar Scientific Society; but it was not until 1862 when Mr. Busk saw it that any special importance came to be attached to it; and it was then transferred to the Museum of the Royal College of Surgeons in England. But, in the meantime, Dr. Fuhlrott in 1857 recovered from a limestone cave in the Neanderthal, near Düsseldorf, the fragments of a human skeleton of like age, including the upper part of a skull whose more obtrusive features, no less than the fact that it came at once into the hands of a competent anatomist, rivetted attention upon it as the relic of a hitherto unknown type of humanity. From the moment when this anatomist (Professor Schaafhausen) claimed that "the extraordinary form of the skull was due to a natural conformation hitherto not known to exist, even in the most barbarous races" and that the "human relics were traceable to a period at which the latest animals of the diluvium still existed," a lively controversy was started, and, with the addition of the highly inflammable material supplied by the appearance of Charles Darwin's classical work, developed into a great conflagration. As Huxley remarked, many years afterward;—"It was suggested that the Neanderthal skeleton was that of a strayed idiot; that the characters of the skull were the result of early synostosis or of late gout; and, in fact, any stick was good enough to beat the dog withal."

Since then many more remains of a variety of ancient types of mankind have come to light, as well as a great deal of information relating to early human handiwork and achievements, the animals which these men of the Old Stone age hunted, and the conditions under which they lived.

Almost every new discovery has started afresh such disputes as followed the finding of the Neanderthal skull; and history has repeated itself with remarkable consistency. For these discussions have invariably followed closely the lines so crisply described by Huxley in the case of the Neanderthal skull. Long before the discovery of these actual fragments of the man of the Old Stone age, archæologists had become aware of his former existence by finding implements of human workmanship in caves and in ancient gravels, often in association with the bones of extinct mammals. But it was not until the year 1887 that the Belgian scientists, Fraipont and Lohest, made the discovery, one of the most important and fundamental in the whole history of the growth of our knowledge of early man, that the Neanderthal people were the makers of the type of stone implements which are now called Mousterian, and that they were contemporaneous with the woolly mammoth, the woolly rhinoceros, the cave bear, and the cave hyæna in Western Europe.

This clearer vision of Mousterian man (*Homo neanderthalensis*) in his natural surroundings stimulated further enquiries; and as the result of a long series of remarkable discoveries, no less than of the intensive investigation of the known material, especially by Schwalbe and Boule among many others, we now have a surprisingly full view of the physical characters and the achievements of this peculiarly distinctive type of humanity, which occupied Europe many thousands of years (Professor Osborn believes more than twenty-five millennia) ago.

The information that has been accumulating has illuminated not merely the Mousterian phase of industry and Neanderthal man, but has revealed also a long succession of later cultural phases and waves of varying types of humanity, all of which, however, differ from the men of the Lower Palæolithic age in conforming much more nearly to the modern type.

The last twenty-two years have also brought to light the fragments of three divergent and much more primitive types of humanity, the genus *Pithecanthropus*, found in Java in 1894 by Dubois; the Heidelberg

jaw found in the Mauer sands by Schoetensack in 1908, which I am inclined to follow Bonarelli in regarding as the remains of a special genus, *Palæanthropus;* and the genus *Eoanthropus* found by Dawson near Piltdown in England in 1912.

The small fragments of these three most primitive members of the human family afford us tantalizingly imperfect glimpses of man in the making, and have not unnaturally supplied the material for some of the most lively controversies in the whole history of anthropology. There are still wide divergencies of opinion in respect to almost every aspect of the problems raised for discussion by these relics.

Recent years have witnessed the extinction of the bitter animosities which, in the sixties and seventies of last century, were inevitably excited by the mere suggestion that man was descended from the apes. The fact of man's descent is no longer questioned, but the intense theological emotions of fifty years ago have now given place to profound differences of opinion concerning the interpretation of the details of the technical evidence as to how man and human institutions were evolved. Every human fragment and scrap of man's handiwork that has been preserved to us from the Old Stone age has become a nucleus around which the liveliest discussions have centered. The anatomist who investigates the features of the human remains, the archæologist who explains the significance of the implements and culture, the zoölogist and palæontologist who deal with the associated fauna, and the geologist who interprets the circumstances under which the remains are found, all take their share in these discussions; and as the conclusion arrived at by each of these investigators has an intimate bearing upon the results obtained by workers in the other fields, there is ample scope for differences of opinion to arise. Perhaps the most difficult problems of all are those which have been raised by the attempts to determine the changes of temperature and climate and the comings and goings of the various mammals, and to associate them with man in the different stages of his chequered career in Europe.

During the last forty years many books have been written in Europe to expound and interpret these highly complex problems; and during recent years the growth of interest in such questions has been shown by a great increase in the number of such works, in England, France, Italy, Germany and elsewhere. Incidentally this has revealed wide discrepancies in the interpretations of the facts by different writers, which in many cases no doubt have been due to the particular angle from which the observer has viewed the evidence, whether it has been from the standpoint of the anatomist, the archæologist, the palæontologist or the zoölogist, respectively, but perhaps even more to the influence of the individual circumstances of each writer.

To those of us who have been involved in this sea of contending factions the news that Professor Henry Fairfield Osborn was preparing a comprehensive survey of the whole field of controversy was received with especial interest and expectation. For not only is Professor Osborn a leading authority on the past history of mammals — a subject which is so intimately interwoven with the records of the men of the Old Stone age — but also he is a scientist who for many years has taken a broad view of the problems of vertebrate evolution. Moreover, as president of the American Museum of Natural History, he commanded the expert advice of specialists in every one of the multitudinous branches of science that are involved in the study of early man and his achievements. For no one man can possibly speak with authority upon every aspect of so vast a theme. Expectation was raised by the news that these complex problems were to be dealt with by a competent investigator, who was far removed from the influence of all those factors that tend to warp the judgment of writers living amidst the turmoil and the conflict of opinions in Europe.

In his "Men of the Old Stone Age" Professor Osborn has given us perhaps the most complete review of all the facts of the case that has appeared in any language within a similar compass. He has dealt very fully with the question of the climatic conditions under which early man lived in Europe; and in his treatment of the problems of the Glacial epoch and of chronology, which are perhaps the most highly controversial of the multitude of thorny topics with which his book deals, he has fallen into line with other American writers and gone the whole way with James Geikie and Penck. In the rest of the book he has dealt equally fully with every aspect of the subject, the history of the discoveries,

the nature and significance of the human remains and the interpretation of their age, the animals associated with them, and the characteristic features of the implements. Perhaps the outstanding feature of the book is the fulness and excellence of the account of the artistic achievements of the Upper Palæolithic people of France and Spain, which Professor Osborn was able to study in company with the three distinguished authorities on this subject to whom the book is dedicated.

Valuable as such a complete and impartial review of all the evidence is to the student of the problems of the childhood of mankind, it is somewhat of a disappointment that Professor Osborn has paid so much deference to what has been written on this side of the world, and has shown such excessive modesty in refraining from dealing more boldly, and on less conventional lines, with the interpretation of the great mass of data he has brought together. For no one is better equipped and more favorably situated than he is for this great work of reading the real meaning of the information now available, and of viewing in broader perspective the story of the Old Stone age. On this side of the world we should like to have had his views also on the question of early man in America, and in fact in the world at large, beyond the limited area of Europe. But, as Professor Osborn has not done all these things, we are none the less grateful for the magnificent volume he has provided.

To review a large volume such as "Men of the Old Stone Age," which itself is a condensed summary of a vast mass of material, is no easy matter. What I propose to do is to pick out of the rich matrix of Professor Osborn's account the story of man himself, and comment upon certain of its aspects.

No human remains have yet come to light which can be referred with certainty to a time earlier than the Pleistocene. There are very definite reasons for including the Javan fossil *Pithecanthropus* within the human family, but also for regarding it as the most primitive member of that family, not on "the direct ancestral line of the higher races of men."

Most modern writers assign its age to the early Pleistocene: but Professor Osborn, without definitely denying this possibility, is inclined to agree with Dubois' original claim that it belongs to the uppermost Pliocene. His reason is that the fossil elephants which occur in Java along with *Pithecanthropus* are also found twenty-five hundred miles away in the foothills of the Himalayas of India, where they are regarded as of the uppermost Pliocene age. But as allied species did not arrive in Europe until early Pleistocene times there is the possibility that the animals whose remains have been found in Java, may also not have wandered east before then.

In any case a vast interval of time elapsed before the only two other known members of the human family earlier than Mousterian man, died in the neighborhood of Piltdown and Heidelberg respectively.

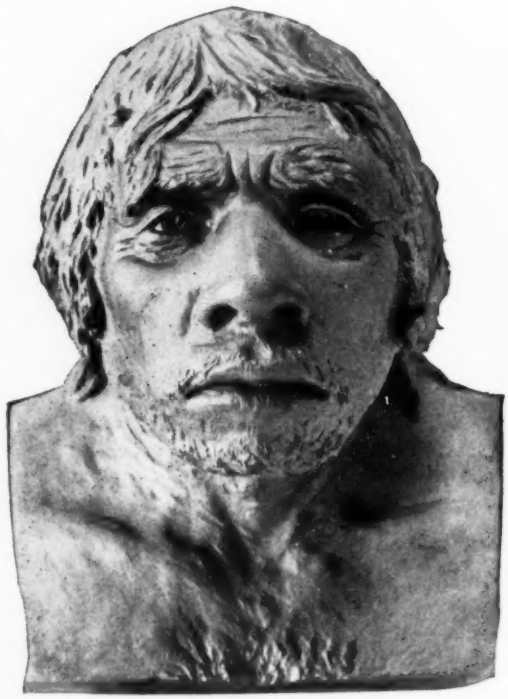
We can only conjecture what was happening to the human family during this enormously long period, in which its doings are completely hidden from our gaze. But it is certain that somewhere in Asia or Africa — and it is important to emphasize the fact that Africa north of the Sahara has never been the home of the negro, as Professor Osborn assumes, except sporadically during the last fifty centuries — the parent stock of apelike men, of which *Pithecanthropus* must be regarded as an offshoot, aberrant alike in structure and habitat, was working out its own salvation, and from time to time budding off colonies of which the Piltdown and Heidelberg genera and the ancestors of the Neanderthal and *sapiens* species are alone known to us.

Dr. Smith Woodward and most of the British geologists, estimate the age of the Piltdown skull as almost, if not quite, as great as that of the Heidelberg jaw. But Professor Osborn regards the latter not only as definitely older, but even as much as twice as old, while *Pithecanthropus* is four times as ancient! This remarkable conclusion is based upon the statement that "as the Piltdown man was found in deposits containing pre-Chellean implements, he probably lived in the last quarter of the Glacial epoch, (not older than the Third Interglacial age) and not in early Pleistocene times as estimated by some Bri'ish geologists," whereas "all authorities agree that the jaw of Heidelberg is probably of Second Interglacial age."

But whether or not there is this wide discrepancy between the ages of the Piltdown and Heidelberg remains, there is no doubt that they represent distinct genera; and in my opinion the former is definitely more primitive and simian than the latter.

It must not be forgotten that the Piltdown

brain-case is the only representative of a pre-Mousterian human skull known to us, excepting only that of the more primitive and aberrant *Pithecanthropus;* and, in spite of its obtrusively human features, in certain respects it is much more primitive and apelike than any other known skull. There has been a vast amount of controversy as to how the real form of this cranium should be reconstructed from the broken fragments that were recovered. Although no two reconstructions that have been made are quite identical, the definite anatomical details clearly discernible on the fragments leave no room for any doubt as to the general form of the skull, and afford no warrant for certain grotesque "restorations" which were exhibited in 1913. It is satisfactory to note that Professor Osborn's restoration is in substantial agreement with Dr. Smith Woodward's, and is a very close approximation to the truth, although I think that they both err slightly in exaggerating the extent of the cranial cavity.



The brute strength of the Neanderthal men did not enable them to hold their own against the species *Homo sapiens* which came after. ***After restoration by J. H. McGregor***

The jaw found with the Piltdown skull is the only part that enables any comparison to be made with the Heidelberg specimen. Now, although the latter is very massive and of primitive conformation, the structure of the chin region — for there is no real chin — and of the teeth is definitely human. The Piltdown jaw however, is equally definitely simian in most of its characters. Some authorities are so impressed by this fact that they claim it to be an ape's jaw, which does not belong to the skull with which it was found.

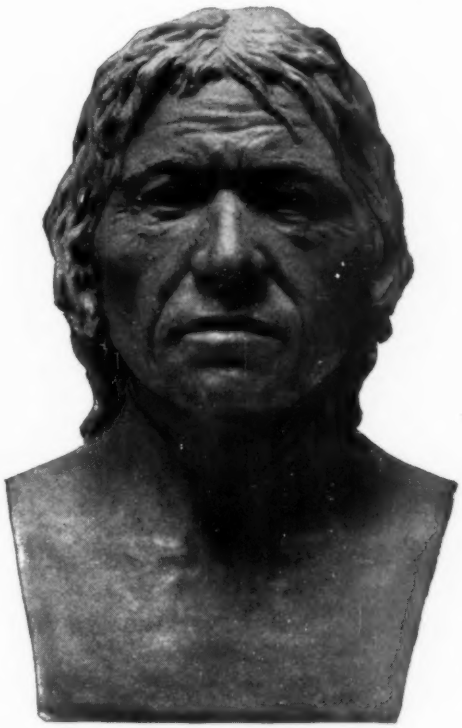
This is not the place to discuss this question. But the acceptance of the view that the jaw is an ape's and the cranium a man's would involve the supposition that a hitherto unknown and extremely primitive apelike man, and an equally unknown manlike ape, died on the same spot, and that one of them left his skull without the jaw and the other his jaw without the skull. Not only so, but it would involve also the admission that an anthropoid ape was living in England in middle Pleistocene times, and would therefore invalidate Professor Osborn's conclusion that the lowering of the temperature in Europe swept out all such apes by the middle of the Pliocene, unless it is claimed that they returned in the Pleistocene But is there any real need for invoking such enormously improbable coincidences and such drastic rearranging of our ideas of the palæontology of Europe? In spite of their primitive form and simian appearance the teeth are human. Theoretical considerations, no less than certain remarkably primitive features of the brain-case, also add confirmation to the view that the jaw really belongs to the skull.

If we admit this, it will follow that, whatever the relative ages of the individuals found near Heidelberg and Piltdown respectively, the latter belongs to an earlier genus than the former.

As to the route by which the Piltdown tribe reached Europe there is no conclusive evidence. Professor Osborn tells us that "so far as present evidence goes it would appear that pre-Chellean culture did not enter

Europe directly from the east, or even along the northern coast of the Mediterranean, but rather along the northern coast of Africa, where Chellean culture is recorded in association with mammalian remains belonging to the middle Pleistocene epoch." "Industry similar to the Chellean, but not necessarily of the same age, is distributed all over eastern Africa from Egypt to the Cape." This then is a faint hint that the earliest type of humanity to reach Europe came from Africa.

For a vast span of time afterward we are completely in the dark as to the history of man in Europe, until there suddenly appears upon the scene, occupying Europe from Gibraltar to Neanderthal, and from England to the Carpathians, the uncouth race of Neanderthal men, characterized by "an enormous head placed upon a short and thick trunk, with limbs very short and thick set, and very robust; the shoulders broad and stooping, with the head and neck habitually bent forward into the same curvature as the back; the hands extremely large and without the delicate play between the thumb and the fingers characteristic of modern races."



The nimble-witted race (*Homo sapiens*, the same as the man of today) was evolved probably near the isthmus between Africa and Asia. It later superceded the Neanderthal race in Western Europe. *After restoration by J. H. McGregor*

In spite of the big brain, this is a vastly different type of humanity from any races that we know today, and one that was unable to hold its own in competition with the superior type of man which we distinguish as the species *sapiens*.

I have quoted from Professor Osborn the hint that the earliest human beings to enter Europe came from Africa. The distribution of Mousterian remains — not forgetting that the most primitive, and possibly the earliest, of them was found at Gibraltar — suggests that the Neanderthal race may have followed the same route. It in turn was superseded by races of men of modern type, before whose nimbleness of mind and skill of hand neither the brutal strength nor the massive brain of the Neanderthal race availed to spare it from extinction. Such evidence as we possess points to the fact that the newcomers also "came through Phœnicia and along the southern coasts of the Mediterranean, through Tunis, into Spain."

The reconstruction of the wonderful story of Upper Palæolithic man and his works is one of the greatest achievements of recent anthropological research, to which Professor Osborn has done full justice in his book.

Somewhere in the neighborhood of the isthmus linking Africa to Asia, *Homo sapiens* was evolved; and from time to time fresh broods of the new type of intelligent and enterprising humanity left the parent stock and took possession of Asia, Africa and Europe, and eventually of the rest of the world. The vanguard of this higher type of man in Western Europe brought with it the germs of the culture known as Aurignacian, which perhaps did not attain its maturity and its distinctive characteristics until the immigrants had been settled for some time in southern France.

One of their most remarkable practices was the mutilation of the fingers and the silhouetting of these damaged members on the walls of caverns. This is one of the earliest

examples of the migration of an element of culture. For this Aurignacian procedure eventually spread to the ends of the earth, so that, long after the major portion of the intervening territories had become swamped with successive waves of other cultures, South Africa, Australia and America have preserved for us the termini of these extremely ancient migrations.

After the Aurignacian culture was established in Europe, another wave, apparently coming through eastern Europe, introduced the Solutrian phase of industry, which in turn gave place to the Magdalenian. The latter was not developed from the Solutrian in Western Europe, nor was the Solutrian derived from the Aurignacian. All three represent distinct offshoots from the common parent in either Asia or Africa, each of which successively intruded into Europe and supplanted its predecessor there. There are reasons for believing that long before the close of the Magdalenian epoch a new culture was beginning to filter into Europe from the South and to make its impress upon the distinctive civilization. Eventually this new influence became dominant and developed into the higher phase which is known as the New Stone, or Neolithic, age. To me the facts seem to point quite clearly and definitely to the conclusion that the Azilian people represent the vanguard of the New Stone age. But Professor Osborn, who impartially summarizes the evidence with great fulness, inclines to the view that the Azilian epoch represents the concluding phase of the Old Stone age. But this fact serves to illustrate the conclusion that there is no real break between the Old and the New Stone ages. The real break is between the Lower and the Upper Palæolithic ages.

One of the most remarkable aspects of modern anthropological thought is that anatomists and archæologists, in many cases, adopt as a self-evident proposition in explanation of their data a view which most ethnologists not only most strenuously reject, but also refuse even to discuss. It is gratifying to find that Professor Osborn speaks with no uncertain voice in favor of the common-sense point of view.

"Certainly the archæologic testimony strongly supports [the] culture-invasion hypothesis." "It is apparent that [in the sudden appearance and development of the Aurignacian industry in Europe] we witness not the local evolution of a single people, but rather the influence and collaboration of numerous colonies reacting more or less one upon the other and spreading their inventions and discoveries."

Amidst the relatively simple conditions of culture in Europe of the Old Stone age this explanation of the facts stands out clearly as the true and only tenable one. But at the same time the study of these early cultures reveals "the great antiquity of the spirit of man and the fundamental similarity between the great steps of prehistory and history."

Men have continued to imitate one another and to borrow ideas the one from the other, from that remote period until today. This has been the chief factor in the upbuilding and the spreading abroad of the civilization to which the world at large is heir at the present time.

"The rise of the spirit of man through the Old Stone age [in Europe] cannot be traced continuously in a single race because the races were changing; as at the present time, one race replaced another, or two races dwelt side by side." Professor Osborn might have added also that then, as now, a small group of immigrants provided with some means of dominating another community, such as superiority of weapons or skill, might force its culture upon, and so leaven that of the subject population.

"The sudden appearance in Europe.... of a human race with a high order of brain power and ability was not a leap forward but the effect of a long process of evolution elsewhere."

"Whether the Neanderthals were exterminated entirely or whether they were driven out of the country, is not known; the encounter was certainly between a very superior people, both physically and mentally.... and a very inferior degenerate people." In fact, "after prolonged study of the works of the Crô-Magnons," Professor Osborn says of these newcomers "one cannot avoid the conclusion that their capacity was nearly if not quite as high as our own." They were in fact members of our own species, *Homo sapiens*, and except for the fact that they lacked the advantages which we enjoy of the knowledge and experience accumulated during many millennia by them and their successors, they were quite as competent and as well-endowed by nature as we are.

They represent what I might call the Neo

anthropic phase of culture — the appearance upon the earth of men capable of formulating ideas and of reasoning, men of imagination, and endowed with an artistic sense and ability not inferior to modern man's powers in these respects.

The arrival in Europe of these men of modern type ought surely to be regarded as the greatest event in its history. Yet the traditional method of subdividing the human epochs does not give due recognition to this fact. At a time when little was known of early man except his stone implements, John Lubbock (afterward Lord Avebury) distinguished the two well-marked cultural phases before the coming of metals as those of the Old Stone and the New Stone — Palæolithic and Neolithic — respectively. But since then we have learned something about the men who made and used these weapons, and have come to appreciate the fact that modern man and the manifestation of the human spirit came into evidence long before the Neolithic epoch. The profound break in human history is not represented by the transition from the Palæolithic to the Neolithic, but by that between the Lower and the Upper Palæolithic.

"Lartet was the first to perceive that the culture of the grotto of Aurignac was quite distinct from that of the Lower Palæolithic." Many later writers, and no one more emphatically than Professor Osborn, have more strongly emphasized the fact that "in the whole racial history of Western Europe there has never occurred so profound a change as that involving the disappearance of the Neanderthal race and the appearance of the Crô-Magnon race" — "*Homo sapiens*, the same race as ourselves."

I would go further and give expression to this well-attested fact in our nomenclature; for without that kind of specific emphasis even the most careful writer is apt to get his perspective distorted. If we refer to the epoch of the modern type of man as the Neoanthropic age, and include in it the Upper Palæolithic and all the subsequent ages of human achievement, the Mousterian period and all of man's record that went before it can then be included in a Palæanthropic age. Such a nomenclature would I think stress the outstanding result of modern research.

If it be urged that the men of the Upper Palæolithic differed radically from their Neolithic successors in their lack of the knowledge of agriculture, the domestication of animals and the manufacture of pottery, I would remind the reader that many races of modern men, which are included within the species *sapiens*, are still without these accomplishments.

Moreover these achievements were all the work of the modern type of man himself and cannot be regarded as essential distinctive features. For the historian of America does not refuse to regard as Europeans the Spaniards and the Portuguese immigrants into America during the sixteenth century because they did not introduce the steam engine and the electric dynamo! Nor does the fact that men of the Upper Palæolithic lived in a different climate and used to hunt many creatures now extinct affect the question. What counts for vastly more than all these facts is the consideration, so aptly put by Professor Osborn, that *Homo sapiens* made his appearance at the close of the Mousterian period, and "effected a social and industrial change and a race replacement of so profound a nature that it would certainly be legitimate to separate the Upper Palæolithic from the Lower by a break equal to that which separates the former from the Neolithic." The evidence marshalled by Professor Osborn clearly points to the conclusion (in fact, another quotation from his book, already cited, actually expresses it) that the former break is even greater, and that the new spirit of mankind really began to manifest itself in Aurignacian times, and continued with no essential change, beyond the acquisition of new arts and crafts into Neolithic and later times.

Vagrant Cats in the United States

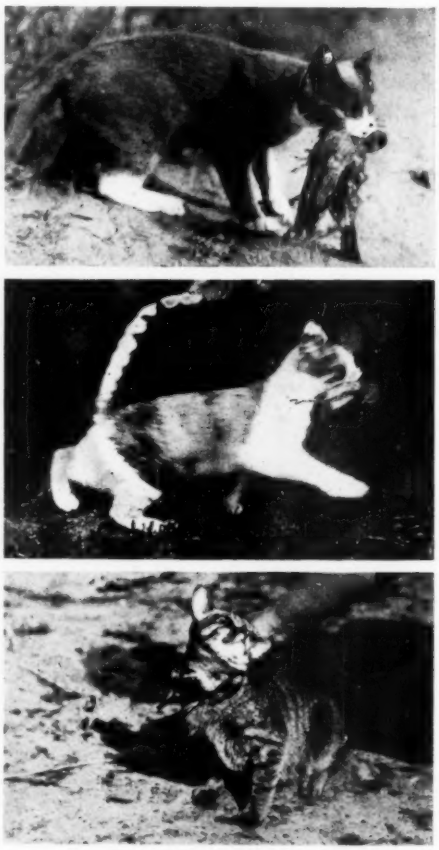
MAN HAS KILLED OUT THE WILD NATIVE CATS IN THE EASTERN UNITED STATES, HAS PROHIBITED BY LAW THE IMPORTATION OF THE MONGOOSE AND OTHER NOXIOUS MAMMALS, IN ORDER TO PROTECT THE COUNTRY'S BIRDS AND OTHER WILD LIFE — YET HAS BY HIS OWN HAND INTRODUCED AS DESTRUCTIVE A SPECIES IN VASTLY LARGER NUMBERS

Brief Review of a Recent Notable Publication [1]

IT is largely on account of the dissension between cat lovers as such and those physicians, game protectors, and bird lovers who wish to see bounds put to the activities of cats, that the Board of Agriculture of the State of Massachusetts has issued a bulletin dealing with the cat and the best ways of utilizing and controlling it. The author of this bulletin, Mr. Edward Howe Forbush, State Ornithologist, has brought together in readable form a mass of information on the history, habits, and proclivities of cats, with opinions of experts, and records and observations of many cat owners and others, in order to establish the proper status of the domestic cat as a useful or harmful economic factor.

The most impressive fact that first emerges in a study of this interesting volume is one probably unknown to the majority of cat owners — namely, that unowned cats abound, literally in hundreds, not only around the towns and villages of New England, but also in the fields and forests in places far remote from human habitations. Cats are mainly nocturnal in their habits, and the large numbers of wild house cats that roam the woods and fields escape general attention on this account, but the evidence collected by Mr. Forbush from many hunters, trappers, naturalists and other observers, leaves no doubt that these vagrant cats are widely distributed, very numerous, and that they constitute a serious menace to wild life.

Under natural conditions the domestic cat is preyed upon by the puma, lynx and wild cat and also by dogs, foxes, wolves, raccoons, and by the golden eagle; but in New England today these enemies are rare



Courtesy of Massachusetts State Board of Agriculture

Vagabond house cat with robin. Many house and barn cats, expected to hunt for a living, make birds their staple diet.— *Cats kill for the love of killing.* This well-fed pet was known to kill fifty-eight birds in one year.— *The bird-killing instinct is incurable.* This cat has been "taught not to kill birds" by tying the victim under her chin, but she still kills them

[1] THE DOMESTIC CAT: BIRD KILLER, MOUSER AND DESTROYER OF WILD LIFE.— MEANS OF UTILIZING AND CONTROLLING IT. Bulletin Number II, Economic Biology. By Edward Howe Forbush. Published by the Board of Agriculture of the State of Massachusetts, 1916.

or nonexistent, and although a fox or dog may catch an occasional cat or kitten, there is no effectual natural agent to check their increase. Moreover, man adds every year to the numbers of these wild cats. Many cats are abandoned by their owners, in the city in the summer, or in the country on returning to town. At the end of the summer of 1914, forty, and one hundred deserted cats respectively, were reported from Orchard Beach, Maine, and from Nantucket Beach, and these are only two of many such reports. The greater number of these cats survive and run wild.

Mr. Frank M. Chapman of the American Museum is quoted as estimating the number of cats in the United States to be at least twenty-five million and possibly twice that number. "Having," says Mr. Forbush, "practically exterminated the wild native cats of the Eastern States, and having passed a national law prohibiting the importation of noxious mammals and birds, we have in the meantime introduced another destructive species in vastly larger numbers, and disseminated it throughout the land so that it must live upon the country as the native cats formerly did. Because of its abundance it has become more destructive to wild life about the dwellings of man than any other creature, and is therefore more injurious or beneficial to man according as it preys upon man's enemies or his friends."

Although some cats in domesticity have been trained to eat food of a vegetable nature, these animals are naturally carnivorous and feed upon birds and small mammals. They kill so often simply for sport, leaving their victims undevoured, that they are exceedingly destructive.

Courtesy of Massachusetts State Board of Agriculture

Locations in Massachusetts of observers who furnished information used in the bulletin "The Domestic Cat," published by the State Board of Agriculture

Dr. A. K. Fisher, in charge of the economic investigations of the United States Biological Survey, estimates that the cats of New York State destroy three million, five hundred thousand birds each year. Young birds and nestlings especially fall a prey, as the cats climb up to the nests. Many game birds are killed, especially ruffed grouse and quail, the latter perhaps the most useful bird of all to the farmer. On state game preserves the records show that depredations of cats cost thousands of dollars yearly, and on many islands where birds are protected the introduction of cats has resulted in complete extermination of some species. In addition, rabbits, moles and shrews, frogs, toads, and lizards succumb to the rapacity of this incorrigible hunter. Of these creatures the shrew alone is of more economic importance to mankind than is the cat, for it eats twice or three times its own weight of insects every day. The food of the toad consists of weevils, caterpillars, potato beetles and other destructive insects, and this animal is so much more useful to the human race than the cat which destroys it, that it should be protected by law. Frogs, lizards and salamanders are also nearly all insectivorous and harmless, and therefore useful each in its own degree, while the economic importance of birds can scarcely be overestimated.

Without going into details as to the different species of birds and their respective values it will suffice to state that the fight against insect pests such as the gypsy moth, the brown-tailed moth, and the elm leaf beetle, cost the State of Massachusetts about nine million dollars in one year (1913). There are about fifty species of birds that feed on the brown-tailed moth and gypsy moth; others devour the elm leaf beetle and other insect ravagers. These birds should be protected and increased in every way possible, but each of these useful species is constantly preyed upon by the domestic cat and is becoming scarcer every year.

What has the cat to set against all this indictment? A canvass of cat owners and cat lovers in Massachusetts brings out the fact that only about one-third of the cats kept in country towns are known to catch rats at all, and only about one-fifth catch them regularly. As mousers, cats make a better general record; but traps and precautions properly used, will free any dwelling of rats and mice, and will do more in a month

towards disposing of them than even a good cat will do in a year.[1]

In spite of the fact that the cat is not a necessity, there will probably always be some who wish to keep cats either as pets or as mousers; but Mr. Forbush is of opinion that if ownerless cats could be eliminated and owned cats confined to the buildings or enclosures of their owners, the cat evil would be considerably lessened.

It is not cruel to keep a cat in confinement. Cats kept in buildings, or brought up in narrow quarters, and well fed, are quite contented and will then be more likely to confine their hunting proclivities to rats and mice. Good feeding alone will not keep a cat from killing birds, but good feeding combined with confinement at night will make it less likely to go afield, especially if a good breakfast is provided before release in the morning. Ninety per cent of cats at present are allowed to roam at night, thus contracting colds and disease to infect the children and other members of the homes they visit, while they destroy more birds and game than rats and mice.

Objections to proposed legislation, directed toward licensing owned cats and destroying vagrants, come chiefly from people who do not wish to pay the tax. Many cat lovers welcome the idea as affording protection to owned cats and avoiding the suffering of others.

This admirable little booklet, which is strongly recommended to the attention of nature lovers and cat owners, brings the discussion to a close as follows;— "The claim of the cat to a place in our domestic life rests primarily on the fact that it is supposed to do for us, with little conscious effort on our part, the onerous and disagreeable task of destroying small rodents. Insomuch as the creature fails in this, and in so far as it destroys other more useful forms of life, in such measure it becomes an evil and a pest. It will become an influence for good or ill according as we mold it, restrain it, and limit its activity. It is our duty to check with a firm hand its undue increase in domestication, and to eliminate the vagrant cat as we would a wolf."

M. H. P.

[1] Those who do not know how to get rid of mice and rats are referred to Economic Biology Bulletin No. 1, *Rats and Rat Riddance*, procured from the Massachusetts State Board of Agriculture, State House, Boston.

Courtesy of Massachusetts State Board of Agriculture

On Muskeget Island a colony of gulls and terns, protected by the town of Nantucket, were almost entirely killed out by a few stray cats, their only enemies. Thousands of nest sites showed only egg shells and the scattered remains of parents

Bird Protective Laws and their Enforcement[1]

By T. GILBERT PEARSON

Secretary of the National Association of Audubon Societies

LAWS for the protection of wild birds and animals have been enacted in greater numbers in the United States than in any other country in the world. In a government bulletin on "American Game Protection," Dr. T. S. Palmer states that the earliest game laws were probably the hunting privileges granted in 1629, by the West India Company, to persons planting colonies in the New Netherlands, and the provisions governing the right of hunting in the Massachusetts Bay Colonial Ordinance of 1647.

As soon as the United States Government was formed in 1776, the various states began to make laws on the subject and these have increased in numbers with the passage of years. For example, between the years 1901 and 1910, North Carolina alone passed three hundred and sixteen different game laws. As various forms of game birds or animals showed indications of decreasing in numbers, new laws were called into existence in an attempt to conserve the supply for the benefit of the people. Not infrequently laws were passed offering bounties for, or otherwise encouraging, the killing of wolves, pumas, and other predatory animals, or of birds regarded as injurious to growing crops or to poultry.

State laws, intended primarily for the protection of wild life, may be grouped as follows:

First, those naming the time of the year when various kinds of game may be hunted; these hunting periods are called "open seasons."

Second, the prohibition of certain methods formally employed in taking game, as for example, netting, trapping, and shooting at night.

Third, the prohibition or regulation of the sale of game. By destroying the market the incentive for much excessive killing is removed.

Fourth, bag limit; that is, indication of the number of birds or animals that may be shot in a day; for example, in Louisiana one may kill twenty-five ducks in a day, and in Arizona one may shoot two male deer in a season.

Fifth, the provision of protection at all seasons for useful birds not recognized as game species.

The term "game," as defined today, includes bears, coons, deer, mountain sheep, caribou, cougar, musk ox, white goat, rabbits, squirrels, possum, wolf, antelope, and moose. Game birds include swans, geese, ducks, rails, coots, woodcock, snipe, plovers, curlews, wild turkeys, grouse, pheasants, partridges, and quail. Sometimes other birds or animals have been regarded as game. Robins and mourning doves, for example, are still shot in some of the southern states as game birds.

Little was done in the way of securing laws for the benefit of song and insectivorous birds and of birds of plumage until 1886, when the bird protection committee of the American Ornithologists' Union drafted a bill for this specific purpose. This bill, besides extending protection to all useful non-game birds, gave the first clear statutory terminology for defining "game birds." It also provided for the issue of permits for the collecting of wild birds and their eggs for scientific purposes. The states of New York and Massachusetts adopted the law that year. Arkansas followed eleven years later, but it was not until the Audubon Society workers took up the subject in 1910 that any special headway was made in getting states to pass this measure. Today it is on the statutes of all the states of the Union but nine, and is generally known as the "Audubon Law."

In all the states but Florida and Mississippi there are special state officers charged with enforcing the bird and game protective laws; usually there is a game commission of three or more members, whose duty it is to select an executive officer who in turn appoints game wardens throughout the state. These men are paid salaries in some cases; in others they receive only a per diem wage, or receive certain fees for convictions. License fees are usually required of hunters, and the money thus collected forms the basis of a fund used

[1] By the courtesy of Mr. T. Gilbert Pearson this further chapter from his book *A Manual of Bird Study*, to be published shortly by Doubleday, Page and Company, is given advance publication in the JOURNAL.

for paying the wardens and meeting the other expenses incident to the game law enforcement.

The Federal Government is also taking some share of the responsibility in preserving the wild life of the Union. On July 2, 1897, Congressman Lacy introduced in the House a bill to prohibit the export of big game from some of the western states. In 1909, some amendments were made to the Lacy law, one of which prohibited the shipment of birds, or parts thereof, from a state in which they had been illegally killed, or from which it is illegal to ship them. The enforcement of this by Federal officers has been most potent in breaking up a great system of smuggling quail, grouse, ducks and other game birds.

Probably the most important game law as yet enacted in the United States is the one known as the "Federal Migratory Game Law," or the "McLean Law." A somewhat extended discussion of this important measure seems justifiable at this time.

When, in 1913, the first breath of autumn swept over the tule sloughs and reedy lakes of the Northwest, the wild fowl and shore birds of that vast region arose in clouds, and began, by stages, to journey toward their winter quarters beneath southern skies. If the older birds that had often taken the same trip thought anything about the subject, they must have been impressed, when they crossed the border into the United States, with the fact that changes had taken place in reference to shooting. In Minnesota, for instance, the firing of guns had begun on September seventh, in other years; but those ducks that reached the Mississippi River below St. Paul found no one at hand waiting to kill them. As they proceeded, by occasional flights, farther down the river, there was still a marked absence of gunners. The same conditions prevailed all the way down the valley until the sunken grounds of Arkansas and Mississippi came into view. What did this mean? Heretofore, at this season, hunters had always lined the river. This had been the case ever since the oldest duck could remember. The Missouri River too was free from shooting throughout the greater part of its length, which surely was sufficient cause for many a grateful quack. What was the reason for this great change? Had the killing of wild fowl suddenly lost its attraction for those who had been accustomed to seek pleasure afield with gun and decoys? No, indeed, banish the thought, for it is written that so long as man shall live, wild ducks shall grace his table and comfort his palate.

The remarkable changes which had so affected the fortunes of the wild fowl were due to the enactment of the new Federal Migratory Game Law on the fourth day of March, 1913. The law did not in itself prohibit wildfowling on the Missouri and Mississippi Rivers between the hours of sunset and sunrise; but it gave authority to certain functionaries to make such regulations as they deemed wise, necessary and proper, in order to extend better protection to all migratory game and insect-eating birds in the United States. The Secretary of Agriculture, to whose department this unusual duty was assigned, read the law thoughtfully, concluded the task did not come within the bounds of his personal capabilities, and very wisely turned the whole matter over to a committee of three experts, chosen from one of the department bureaus known as the "Biological Survey."

This committee, consisting of Messrs. T. S. Palmer, A. K. Fisher and W. W. Cooke (all names well known in bird protection circles), at once began the preparation of a series of regulations to give effect to the new statute. Drawing extensively from the records stored in the survey offices, and seasoning these with their own good judgment and knowledge of existing conditions, they brought out in a period of three months and nine days, or to be more precise on June twenty-third, nineteen hundred and thirteen, a set of ten regulations which, in many ways, have revolutionized shooting in the United States. These were printed in pamphlet form and distributed widely; for before they could take effect as law it was necessary that they should be advertised for a period of at least three months in order to give all dissatisfied parties an opportunity to be heard.

The whole idea of the Government taking over the matter of protecting migratory birds, and the startling character of some of the regulations promulgated by the committee, were justly expected to bring forth either shouts of approbation or a storm of disapproval, and possibly both sounds might be heard. Long experience has shown that it is necessary for public opinion to approve of a game law if it is to be effective. Thus it was that, following the mailing of circular rules, the gentlemen of the committee stood,

metaphorically, on tiptoe and, with hand to ear, scanned the distant horizon. Nor did they have long to wait before critical rumblings began to be heard in many directions.

"Why allow bobolinks to be shot during the months of September and October in Maryland, District of Columbia, Virginia and South Carolina, and deprive the people of our State of this heavenborn privilege which we have always enjoyed?" shouted a lusty North Carolina hunter.

"If you are going to place a five-year close season on the shooting of curlew, why not also include the golden plover, which every one knows is equally rare?" a bird protectionist wished to know.

"It may be all right to curtail our spring shooting, but if so, we want to be shown," the Missouri sportsmen observed, in tones that left no doubt as to their earnestness.

As the committee waited, the sky began rapidly to fill with interrogation points; for it has ever been the case that the dissatisfied ones of the earth are louder in their objections than are the satisfied ones in their commendations. As a matter of fact, the regulations were on the whole remarkable for their clearness, directness and fairness. They came nearer being formed for the benefit of the birds, instead of for the pleasure and convenience of the hunters, than any general, far-reaching, bird-protective statute which had been enacted in this country.

Let us examine briefly this unusual document prepared by the Biological Survey. For the purposes of the regulations, migratory game birds are defined as ducks, geese and swan, rail and coots, pigeon, crane and shore birds, which include plover, snipe, woodcock, and sandpipers. Migratory insectivorous birds are enumerated as thrushes, orioles, larks, swallows, wrens, woodpeckers and all other perching birds that feed entirely, or chiefly, on insects.

Having thus conveniently classified migratory birds into two easily comprehensible and distinguishable groups, the way was open to deal with them separately and distinctively. Therefore, after declaring it to be illegal to kill any bird of either class between sunset and sunrise, the regulations go on to state that excepting bobolinks, which may be shot in a few states, no insect-eating bird shall be killed in any place or in any manner, even in the daytime.

This provision, by one stroke, completed the campaign which the Audubon Society had been waging for long years on behalf of the robin. In Maryland, North Carolina, Mississippi, Louisiana and Tennessee, the robin-potpie-loving inhabitants must in future content themselves with such game birds as quail, grouse, wild turkeys, and ducks. The life of Sir Robin has now been declared to be sacred everywhere. He and his note are to dwell beneath the protection of the strong arm of the United States Government.

Another feature of the Audubon work was also completed by this section of the new regulations: that is, the safeguarding of all song and insect-eating birds in the states of Montana, Idaho, Nevada, Maryland, Utah, Arizona, Nebraska, Kansas, and New Mexico, constituting the group of states whose legislatures had thus far withstood the importunities of the Audubon workers to extend protection to such birds.

Having disposed thus of the subject in so far as it applied to non-game birds, attention was turned again to game birds. Taking into consideration the fact that some of the migratory game birds had been killed until they were alarmingly few in numbers, and that if the species were to be saved all shooting of them must for a time be stopped, regulation number four was provided and read as follows:

"A close season shall continue until September first, nineteen hundred and eighteen, on the following migratory game birds: Band-tailed pigeon; little brown, sand-hill and whooping cranes; swans, curlew, and all shore birds except the black-breasted and golden plover, Wilson or Jack snipe, woodcock, and the greater and lesser yellowlegs."

Recognizing the fact that the above includes three swans and fifty-four shore birds, we may see that what the paragraph really does is to prohibit for five years the killing of sixty-two varieties of birds which have heretofore been regarded as legitimate game throughout the greater part of North America.

This section goes on to provide: "A close season shall also continue until September first, nineteen hundred and eighteen, on wood ducks in Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, West Virginia, Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Kansas, California, Oregon, and Washington; on rails in

California and Vermont; and on woodcock in Illinois and Missouri.

The most exquisitely colored of all American water fowl is the wood duck, which was formerly abundant about the ponds and streams almost everywhere in the Eastern States. So rapidly is it disappearing before the remorseless advance of civilization that it seems a pity the committee of specialists did not include the name of this much persecuted species in the former paragraph. The suspension of hunting on the two great rivers of the interior was avowedly done for the purpose of permitting waterfowl to have a safe highway from their winter feeding grounds, along the Gulf Coast, to their nesting areas in Minnesota, the Dakotas, and Canada. The wisdom of this plan is at once apparent and it is to be deplored that topographical conditions did not permit the establishment of like routes of safety along the Atlantic and Pacific seaboards.

The above includes what we might call the minor regulations proposed by the Biological Survey Committee. Then comes the big regulation, the one which is of absorbing interest to every member of the vast army of five million hunters in the United States. This is the regulation which divides the country into zones and prescribes the shooting season in each. Touching on this point the government experts already mentioned gave out this statement by way of explanation:

"More than fifty separate seasons for migratory birds were provided under statutes in force in nineteen hundred and twelve. This multiplicity of regulation or zones to suit special localities has apparently had anything but a beneficial effect on the abundance of game. The effort to provide special seasons for each kind of game in each locality merely makes a chain of open seasons for migratory birds, and allows the continued destruction of such birds from the beginning of the first season to the close of the last. It is believed that better results will follow the adoption of the fewest possible number of zones and the regulation of the seasons in each so as to include the time when each species is in the best condition, or at the maximum abundance, during the autumn. For this reason the country has been divided into two zones, as nearly equal as possible, one to include the states in which migratory game birds breed or would breed if given reasonable protection, the other the states in which comparatively few species breed, but in which many winter. Within these zones the seasons are fixed for the principal natural groups, waterfowl, rail, shore birds, and woodcock. In no case does the zone boundary cross a state line, and except in very rare cases the seasons are uniform throughout the states. Deviation from this rule leads ultimately to the recognition of a multiplicity of local seasons, which has done much to retard game protection."

The "breeding zone" referred to is made to include all the states lying wholly or in part north of latitude forty degrees and the Ohio River. Twenty-five states in all are thus designated and they embrace virtually the entire region in which wild fowl in any numbers have been known to make their summer homes today.

The "wintering zone" consists of the states lying wholly or in part south of this line, and includes twenty-three states and the District of Columbia.

In the northern zone, the season when ducks, geese, brant, and unprotected shore birds are allowed to be killed is between September first and December sixteenth, that is, three and one-half months. At no other season may they be hunted or taken without making the adventurous sportsman liable to the pains and penalties of the law to the extent of a fine of one hundred dollars or ninety days in jail. There are a few exceptions to this season, made out of respect to existing state statutes or in deference to expressed public opinion, but there are not many. One of those is in New York State, where, with the exception of Long Island, no hunting is allowed until September sixteenth, thus making the open season only ninety days in length. Considering the number of gunners in this large state and the relatively small number of birds, one may judge the season to be quite long enough.

In the southern zone the shooting season for shore birds is the same as in the north; but the waterfowl season has been slipped forward, that is, it is made to run from October first until January sixteenth. Here also we find a few exceptions to the general rule. There is, too, an open season in both zones, running from two to three months, on the killing of woodcock and rails.

The above statements regarding open and close seasons on migratory game birds refer to a subject principally of interest to sports-

men, but the big fact that more restrictive measures have been taken for the protection of our wild bird life should be of decided interest to all members of the great non-shooting public.

To go back a little and make our story more complete, it may be said that when the Biological Survey Committee had promulgated their proposed regulations, and had had time to sift some of the more serious complaints, a series of hearings was arranged in different parts of the country. To these gatherings came sportsmen, game commissioners, Audubon Society men, and others who had things to say and to learn. A member of the committee was present to explain the law, hear objections, and answer questions, and in a large number of instances he sent the various delegates away more or less content that the regulations should stand as they were.

As might be expected, it has been found necessary to make some changes, especially in regard to state exceptions, but these have not been numerous, and the regulations as shown above were embodied in a proclamation signed by President Wilson on October first, 1913. This had the effect of giving the regulations the full force of the law.

Today, for the first time in the history of wild life conservation, we have before us the unusual spectacle of the United States Government taking a serious hand in a problem which had been found to be too difficult for solution by the different states working separately. Many of us believe that this foretells a brighter day for the perpetuation of the wild life of our country.

Museum Notes

SINCE the last issue of the JOURNAL the following persons have become members of the Museum:

Life Members, JAMES GORE KING, JR., HAROLD I. PRATT, and MASTER JOHN WALDO DOUGLAS;

Sustaining Member, previously an Annual Member, MR. A. AUGUSTUS HEALY.

Annual Members, MRS. PAUL GOTTHEIL, MRS. CHARLES H. LUDINGTON, and MRS. FREDERICK H. OSBORN, DR. C. G. CAMPBELL, and MESSRS. ELMER DEAN COULTER, J. H. JASPER, WILLIAM GILMAN LOW, JR., ROSWELL SKEEL, JR., and LELAND S. STILLMAN.

IN order to ensure the safe return of the Crocker Land and relief expeditions, the Crocker Land Committee has chartered the steamer "Danmark" and provisioned it for the relief of the explorers. The "Danmark" will proceed from its base in south Greenland to Egedesminde, where Mr. Fitzhugh Green has been instructed to go on board to represent the Committee until Dr. E. O. Hovey or Mr. Donald B. MacMillan is reached. Mr. Jerome Lee Allen, also at Egedesminde, will either board the "Danmark," or return to America via Copenhagen, as he elects. At North Star Bay, Dr. Hovey, Captain George E. Comer, and Messrs. Harrison J. Hunt and W. Elmer Ekblaw, will be taken on board; and Mr. MacMillan will probably have returned from his western trip and will be found at Etah. The explorers will then be taken in the "Danmark" to St. John's or Sydney, where they should arrive in late August or early September. Mr. Maurice C. Tanquary arrived in New York on June 20, and brought with him reports from Dr. Hovey and Mr. MacMillan.

The wrecking of the "Diana," the breaking down of the first relief ship "Cluett" owing to unusual ice conditions, and the difficulty of securing a thoroughly reliable vessel at this time owing to the disturbed state of shipping, has made the expense of relieving the expedition greater than could possibly have been foreseen. The charter fee alone of the steamer "Danmark" is $18,300; other unexpected expenditures make the total of $40,000 to be raised by the Crocker Land Committee to ensure the safe return of the two parties. In this great emergency any contributions that those interested in scientific exploration are inclined to make will be much appreciated by the Committee.

THE Museum has recently received a gift of $10,000 from Mrs. Russell Sage, and in view of her interest in the conservation of bird life the Trustees have assigned this to a

special fund, the income of which is to be devoted to the enrichment of the Museum's collection of birds. The fund has been designated "The Margaret Olivia Sage Fund," and in recognition of the gift the Trustees have elected Mrs. Sage an Associate Benefactor of the Museum.

In the forty-seventh annual report of the American Museum of Natural History, President Henry Fairfield Osborn lays stress upon the urgent need of the institution for more space. No building has been added since the erection of the southwest wing under the law of 1905, while the collections have doubled in extent, important educational departments have been opened, available space in the present building is crowded to capacity, and the scientific and educational value of some of the finest collections in the world is lost for lack of a building in which to house them. The estimated cost of the proposed new southeast wing and court building is $750,000. It will provide space for the collections of mammals of the sea and fauna of Europe and Asia; for the splendid collections of existing fishes and reptiles, now crowded away in the dark and out of sight; for the superb collection of whales hitherto not exhibited; for other collections, and for offices, laboratories and storage room which are seriously needed. Since it seems possible that the finances of New York City will not permit of the building of this extension in the near future, the question is being considered by the Trustees of the Museum as to the advisability of raising funds for the new wing by private subscription and solving in this way a problem that is rapidly reaching a crisis.

Advices from Mr. Roy Chapman Andrews, dated from Shanghai, May 18, indicate that conditions in China will not interfere with the carrying out of the plans of the American Museum's expedition there. Mr. Andrews intends to work in Fukien Province, until the arrival of Mr. Edmund Heller, when the expedition will proceed into Kweichow Province as previously arranged.

Dr. Herbert J. Spinden has recently returned from Venezuela, where he has spent some months in an archæological reconnaissance of the northern and central parts of this comparatively untried region, theoretically of great importance for the light it may throw on certain possible cultural connections. The construction and decoration, for instance, of the figurine idols found in caves and near sacred lakes on the Andean paramo, distinctly indicate a cultural bond between Venezuela and Central America. Studies made on the shores and islands of Lake Valencia, along the Orinoco, and elsewhere, show a series of types such as might be due to divergent regional development, while other features of Venezuelan archæology, as for instance, urn burial, indicate customs once prevalent all over this area. These burial urns, containing dessicated human remains in a sitting posture, are found throughout Venezuela, in caves, low mounds, or more generally about two feet underground, and the practice probably extends considerably beyond the limits of Venezuela itself. It is known also in Nicaragua and in the southern United States. Dr. Spinden is of opinion that the plastic art of Venezuela is identical with the "archaic art" already known in Mexico and Central America, and that this archaic culture, always indicating an agricultural people, skilled in the making of pottery and textiles, once extended across northern South America, and will provide a connecting link between the remarkable pottery of Marajó, at the mouth of the Amazon, and the very simple ceramic ware of the Valley of Mexico. Full data and details of this exploration will shortly be published in the *Anthropological Papers* of the American Museum of Natural History, while briefer reports of Dr. Spinden's Venezuelan studies in the Journal will come with the usual authority and charm of his articles.

At a meeting of the Trustees of Columbia University on May 1, Dr. William K. Gregory was promoted to the rank of assistant professor of vertebrate palæontology, and was assigned a seat in the Faculty of Pure Science. Dr. Gregory graduated from Columbia in the class of 1900, and has since been closely associated with Professor Henry Fairfield Osborn in the latter's courses at the University and his researches at the American Museum of Natural History. Dr. Gregory's appointment assures the continuation of the two principal courses on the evolution of the vertebrates and the evolution of the mammals, which were opened by Professor Osborn in 1892 and have since been

carried on continuously in Columbia University and at the American Museum of Natural History. The students in these courses have had full access both to the study and the research material of the American Museum. After twenty-five years of active service in Columbia University Professor Osborn has continued as research professor of zoölogy (since 1910), and in this capacity has published two of his chief works, *The Age of Mammals* (1910), and *Men of the Old Stone Age* (1915). These are designed especially for the use of college and university students. The next work in this series of volumes will be entitled *The Evolution of the Vertebrates*, the leading author of which will be Professor Gregory, who is preparing the work in collaboration with Dr. Bashford Dean, Dr. Charles R. Eastman, and Dr. William Diller Matthew of the American Museum staff. This volume was projected by Professor Osborn in 1895 in coöperation with Professor J. Howard McGregor, but after a series of delays in its preparation the entire series of illustrations, and the manuscript as far as prepared, have been turned over to Professor Gregory.

THE Museum has recently received from Mr. Roy Latham, of Orient, Long Island, several fishes which are interesting because they throw light on migration up and down the Atlantic Coast. There is a great difference in the character of marine fishes found north and south of New York at different seasons. In summer the dividing line between northern and southern species is somewhere in the vicinity of Cape Cod, in the winter, of Cape Hatteras. It results that in the latitude of New York many fishes are migrants of seasonal occurrence like the birds, their dates of arrival and departure however, being comparatively little known.

THE preparation and mounting of some of the large mammal skins of the Congo collection was begun early in April in the studio of Mr. Carl E. Akeley in the Museum. Specimens of the white rhinoceros and of the okapi, for the groups of these animals to be installed in the projected new African hall, are now being worked upon, and all the material is being mounted by Mr. Akeley's new taxidermic process, which is giving extraordinarily satisfactory results. The group of the rare African okapi will be of unusual importance, because the complete data at hand will make it possible to present this animal authoritatively and truthfully as has never been done before.

Mr. James L. Clark is associated with the work for the African hall, and several assistants have been added to the force in the elephant studio.

AN expedition to Nicaragua, Central America, to obtain reptiles and fishes for the collections of the American Museum is now in the field, financed by the Cleveland H. Dodge Fund of the American Museum. The expedition is in charge of Mr. Clarence R. Halter, assistant in herpetology at the Museum, and Mr. L. Alfred Mannhardt, of Yale University. Nicaragua has a rich reptile fauna which is of unusual interest, not only because of the great diversity in the topographical features of the region, but also because the isthmus today forms a transition tract between the two continents and is supposed, in the past, to have had land connection with Cuba and Jamaica. The expedition plans to proceed by slow stages up the Bluefields River, by steamer and canoe, collecting in the interior to the north and the south; then, crossing the Chontales Mountains, to collect on the eastern and western slopes southward to the river San Juan, which will be followed eastward to the coast. In addition to the enrichment of the Museum's collections, it is hoped that ecological and other studies made in the field will prove of value toward the construction of a habitat group of the reptiles of Nicaragua. The expedition will be in the field between three and four months, with headquarters at Bluefields, on the Atlantic side.

UNDER the will of the late Charles E. Rhinelander the Museum is to receive the sum of $8000, and may possibly become later a further beneficiary to the extent of $12,000 from a trust fund.

THE memorial tablet to the late John Pierpont Morgan, designed and executed by Miss Beatrice Longman and presented to the Museum by the Trustees, has been set into the south wall of the gem room on the fourth floor, where is housed the Morgan collection of gems. The simplicity of the memorial is in accord with the wishes of Mr. Morgan's son, and the inscription is taken from the resolution of appreciation passed by the Trustees on the occasion of Mr. Morgan's

death. Miss Longman, who is a pupil of the sculptor, Daniel French, has achieved in this tablet a work of art not unworthy to rank among those collected by the lover of art whom it commemorates.

THE permanent endowment of the Museum has been enriched by the receipt of $10,000 from the estate of Mr. Emil C. Bondy in payment of a bequest.

MR. L. D. KELLOGG has been elected a Patron of the Museum in recognition of his generous support of the Crocker Land Expedition.

MR. GEORGE C. LONGLEY has added the specimens resulting from his last winter's archæological work in the island of Jamaica, to the collection previously presented by him to the Museum. The Longley collection is believed to be the largest and most representative one from Jamaica in existence.

THE annual convention of the National Education Association, July 1–8, was attended by thousands of teachers from all parts of the United States. A luncheon was given by the Trustees of the American Museum to the members of the science department of the Association on Friday, July 7, in the Philippine hall of the Museum, and the Museum's auditorium was placed at the disposal of the science department on that date.

The department of public education of the Museum prepared a special exhibition of the American Museum's educational work in connection with the schools and libraries of the city, including the circulating nature study collections, the work for the blind, and the system of loaning lantern slides; this is still on view in Memorial Hall. Also, a special leaflet was printed and distributed, calling attention to the most important and interesting exhibits in the Museum.

Professor Henry Fairfield Osborn, of the American Museum, addressed the Association on July 6, at the Metropolitan Museum of Art, and also on July 7, at the American Museum, taking for his subject on the latter occasion, "The Museum as the New Force in Public School Development."

MR. ARTHUR L. GILLAM has enriched the collections of the American Museum by the gift of a considerable series of Florida reptiles and batrachians. The new collection numbers two hundred and fifty specimens. It includes many examples of certain of the poisonous snakes of Florida — diamond-back rattlers, water moccasins and coral snakes — and also many alligators, ranging in size from seven feet to ten inches. Mr. Gillam sent the greater part of the material alive, by express, from the field; thus many of the specimens are being used as studies for wax casts which will find place in the Florida reptile group now in process of construction in the Museum, under the supervision of Miss M. C. Dickerson.

THE collections of the American Museum of Natural History are constantly and increasingly made use of for study by teachers and classes from the schools of the city and from a considerable radius of the country around. In order that full advantage may be taken of the varied and extensive exhibits, without expenditure of much time in preliminary study, the Museum's department of public education, in coöperation with the staff of the various scientific departments, is preparing a teacher's handbook, indicating the ways in which the exhibits can best be utilized in the teaching of geography, history, natural science, and economics. The complete handbook will include sections on the North American Indian collections, the habitat bird groups, mammals, fossil vertebrates, reptiles, batrachians, invertebrates, insects, public health, and other branches of natural science.

PART I of this handbook, dealing with the North American Indian collections, is now ready, and may be obtained at the Museum. It provides a short ethnological summary of the material to be found in the four Indian halls of the Museum, followed by detailed and illustrated suggestions as to ways of using these in teaching elementary history, English, and geography, taking into consideration the school requirements in each case. References to other exhibits in the Museum are indicated where appropriate, and a list of suggested reading for the teacher is provided for each subject, while floor plans of the various halls make it easy to find the designated objects. This section of the handbook has been prepared by Miss Ann E. Thomas, of the department of education, with the advice and criticism of Dr. Pliny Earle Goddard, curator of ethnology.

The American Museum of Natural History

Seventy-seventh Street and Central Park West, New York City

Open free to the public on every day in the year.

The American Museum of Natural History was established in 1869 to promote the Natural Sciences and to diffuse a general knowledge of them among the people. It is dependent upon private subscriptions and the fees from members for procuring needed additions to the collections and for carrying on explorations in America and other parts of the world. The membership fees are,

Annual Members	$ 10	Patrons	$1,000
Sustaining Members (annually)	25	Associate Benefactors	10,000
Life Members	100	Associate Founders	25,000
Fellows	500	Benefactors	50,000

Guides for Study of Exhibits are provided on request to members and teachers by the department of public education. Teachers wishing to bring classes should write or telephone the department for an appointment, specifying the collection to be studied. Lectures to classes may also be arranged for. In all cases the best results are obtained with small groups of children.

The Museum Library contains more than 60,000 volumes with a good working collection of publications issued by scientific institutions and societies in this country and abroad The library is open to the public for reference daily — Sundays and holidays excepted — from 9 A. M. to 5 P. M.

The Technical Publications of the Museum comprise the *Memoirs*, *Bulletin* and *Anthropological Papers*, the *Memoirs* and *Bulletin* edited by J. A. Allen, the *Anthropological Papers* by Clark Wissler. These publications cover the field and laboratory researches of the institution.

The Popular Publications of the Museum comprise the JOURNAL, edited by Mary Cynthia Dickerson, the *Handbooks*, *Leaflets* and *General Guide*. The following list gives some of the popular publications; complete lists, of both technical and popular publications, may be obtained from the Librarian.

POPULAR PUBLICATIONS

HANDBOOKS

NORTH AMERICAN INDIANS OF THE PLAINS. By Clark Wissler, Ph.D. *Paper, 25 cents; cloth, 50 cents.*

INDIANS OF THE SOUTHWEST. By Pliny Earle Goddard, Ph.D. *Paper, 25 cents; cloth, 50 cents.*

ANIMALS OF THE PAST. By Frederic A. Lucas, Sc.D. *Paper, 35 cents.*

DINOSAURS. By W. D. Matthew, Ph.D. *Price, 25 cents.*

ILLUSTRATED GUIDE LEAFLETS

GENERAL GUIDE TO THE COLLECTIONS. New edition issued December, 1914. *Price, 25 cents.*

THE COLLECTION OF MINERALS. By Louis P. Gratacap, A.M. *Price, 5 cents.*

NORTH AMERICAN RUMINANTS. By J. A. Allen, Ph.D. *Price, 10 cents.*

THE ANCIENT BASKET MAKERS OF SOUTHEASTERN UTAH. By George H. Pepper. *Price, 10 cents.*

PRIMITIVE ART. *Price, 15 cents.*

THE BIRDS OF THE VICINITY OF NEW YORK CITY. By Frank M. Chapman, Sc.D. *Price, 15 cents.*

PERUVIAN MUMMIES. By Charles W. Mead. *Price, 10 cents.*

THE METEORITES IN THE FOYER OF THE AMERICAN MUSEUM OF NATURAL HISTORY. By Edmund Otis Hovey, Ph.D. *Price, 10 cents.*

THE HABITAT GROUPS OF NORTH AMERICAN BIRDS. By Frank M. Chapman, Sc.D. *New edition in course of preparation.*

THE INDIANS OF MANHATTAN ISLAND AND VICINITY. By Alanson Skinner. *Price, 20 cents.*

TREES AND FORESTRY. By Mary Cynthia Dickerson, B.S. *A new edition in course of preparation.*

THE PROTECTION OF RIVER AND HARBOR WATERS FROM MUNICIPAL WASTES. By Charles-Edward Amory Winslow, M.S. *Price, 10 cents.*

PLANT FORMS IN WAX. By E. C. B. Fassett. *Price, 10 cents.*

THE EVOLUTION OF THE HORSE. By W. D. Matthew, Ph.D. *Price, 20 cents.*

MAMMOTHS AND MASTODONS. By W.D.Matthew, Ph.D. *Price, 10 cents.*

HOW TO COLLECT AND PRESERVE INSECTS. By Frank E Lutz, Ph.D. *Price, 10 cents.*

OUR COMMON BUTTERFLIES. By Frank E. Lutz, Ph.D., and F. E. Watson. *Price, 15 cents.*

THE BIG TREE AND ITS STORY. *Price, 10 cents.*

REPRINTS

THE GROUND SLOTH GROUP. By W. D. Matthew, Ph.D. *Price, 5 cents.*

THE WHARF PILE GROUP. By Roy W. Miner, A.B. *Price, 5 cents.*

THE SEA WORM GROUP. By Roy W. Miner, A.B. *Price, 10 cents.*

THE ANCESTRY OF THE EDENTATES. By W. D. Matthew, Ph.D. *Price, 5 cents.*

HEREDITY AND SEX. By Frank E. Lutz, Ph.D. *Price, 10 cents.*

THE AMERICAN MUSEUM
OF
NATURAL HISTORY

FOR THE PEOPLE
FOR EDVCATION
FOR SCIENCE